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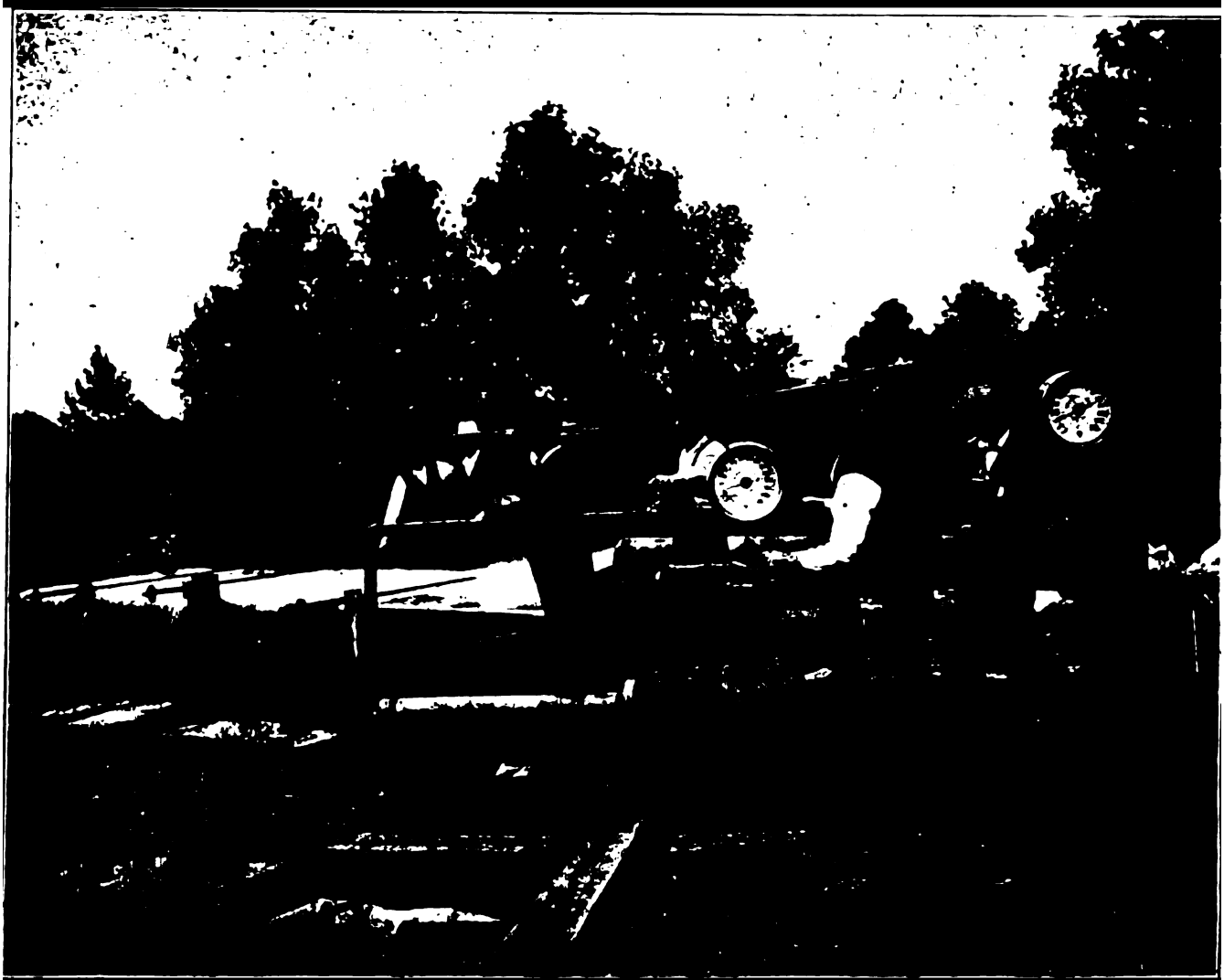

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Municipal Engineering

VOLUME XV. JULY, EIGHTEEN NINETY-EIGHT. NUMBER 1.

STANDARD PAVING BRICK TESTS.

By Charles Carroll Brown, M. Am. Soc. C. E.

At the last meeting of the Illinois Society of Civil Engineers and Surveyors, the Committee on Tests of Paving Brick presented a report which differed in some respects from the recommendations of the National Brick Manufacturers' Association. Professor A. N. Talbot, of Illinois State University, was the chairman of the committee. He thought at that time that it was possible the abrasion test recommended by the Association would not discriminate against soft brick with sufficient clearness. The use of foundry shot of definite dimensions is recommended by Professor Talbot, who considers the shot known as the University of Illinois Standard to be most satisfactory. This consists of cast iron blocks of two sizes, equal weights of the two sizes to be used in a charge. One size is 2½ x 3⅛ x 5¼ inches, weighing about 8 pounds, and the other size is 1x1½x2½ inches, weighing about 1 pound. Both have rounded edges, the larger with a radius of one-half inch. It is claimed that when a charge consists entirely of brick of one quality, with no harder material, soft brick will not act upon each other with any greater proportional force than hard brick act upon each other, so that when the bricks are weighed the amounts of loss in the two grades of brick will not differ materially, and the soft brick will attain to a standing in the table of tests nearly, or quite, equal to that of a brick which is materially harder. If the standard foundry shot is used we have a material of standard hardness, size and weight whose effect is presumably proportional to the softness of the brick.

In the *Technograph*, the annual publication of the Engineering Department of the University of Illinois, just issued, Professor Talbot presents a report of a series of tests intended to show the differences between the two methods. Four kinds of brick were selected, one an excellent repressed shale paver, the second a similar brick, the third a good surface-clay brick which in use has shown itself inferior to the two preceding, and the fourth a high grade sewer or building brick. Each kind of brick was put through the standard abrasion test of the N. B. M. A., with 15 per cent. of the rattler filled with brick, with a rattler 18 inches long and also with one 36 inches long, with 30 revolutions a minute. The diameter of the rattler was slightly below standard, being 24 inches. Each kind of brick was also tested by the proposed standard with 150 pounds of each size of shot de-

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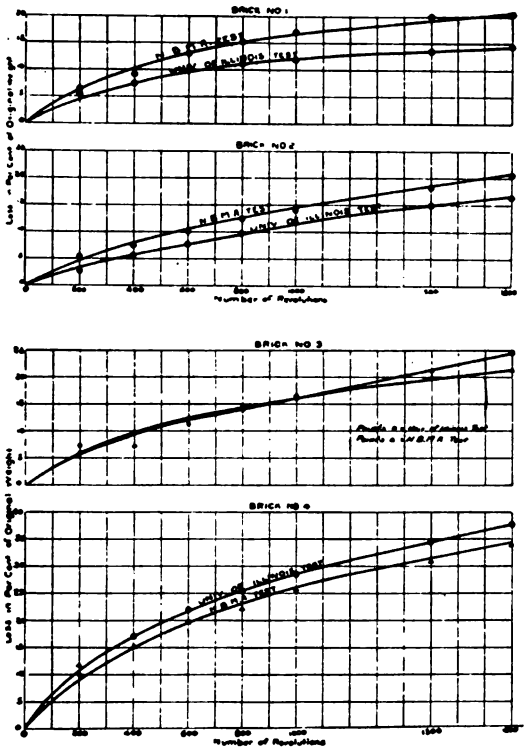
scribed above and 12 bricks for 36-inch length of rattler and half this amount for 18-inch length of rattler, and a speed of 20 revolutions a minute. The following diagrams show the resulting percentages of loss by the two methods after 200, 400, 600, 800, 1,000, 1,500 and 1,800 revolutions respectively:



RATTLER LOSSES OF BRICK.

It will be seen that for the best brick, the N. B. M. A. test gives greater abrasion than the University of Illinois test, for the softer brick the curves cross, the N. B. M. A. test giving less abrasion for more than 1,000 revolutions, and for the sewer brick the N. B. M. A. shows a loss only about 12 per cent. greater than the others, in 1,800 revolutions. On the other hand, the University of Illinois test shows a sharp distinction between the various bricks, the percentages of loss being for bricks 1, 2, 3 and 4, respectively about 14, 16, 24 and 38 per cent. (1,800 revolutions). It is interesting to note that the results from the two methods correspond most closely in the case of the softer paving brick tested.

It should be noted that the number of kinds of brick tested is small, and that the number of individual

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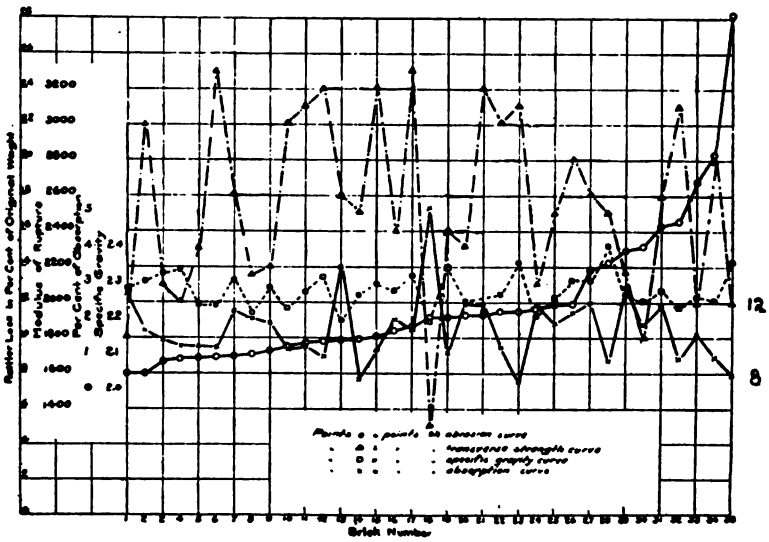
Enough evidence is presented to demonstrate the desirability of more extensive experiments along this line. If so slight a change in the standard method of testing as that proposed will increase the definiteness of the indications so much as is here shown, time and money spent in demonstrating it will be well spent. The N. B. M. A. test has the merit of ease of application, as no special apparatus is needed beyond what is easily found in any city likely to apply the test, while Professor Talbot's



RESULTS OF TESTS OF PAVING BRICK.

modification would require the preparation of the special blocks of iron proposed. If further experiment shows that the results here presented are not accidental, the value of the modification is much more than the slight trouble and expense of procuring the blocks would measure.

Another interesting diagram in Professor Talbot's article is one giving the results of tests on thirty-five different brands of first-class brick from Ohio, Indiana, Illinois, Iowa and Missouri. In the diagram the results are arranged in the order of loss by abrasion. The diagram is interesting mainly because it shows the practical independence of the various tests. Professor Talbot thinks he sees a slight indication that the transverse strength decreases as the loss from abrasion increases, but if the results are arranged in the order of transverse strength, this indication practically disappears. There is no definite relation between specific gravity and either abrasion loss or transverse strength. The absorption seems to decrease slightly as the transverse strength increases, and there is a less positive indication that the absorption decreases as the abrasion loss increases. The indications of this diagram are therefore that each test must be made on its own merits and that a standard of rejection based on any one test will reject many bricks which stand high in other tests. The question of the advisability of restricting the tests to the one of abrasion as recommended is thus shown to be one the answer to which will depend upon the opinion of the individual

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engineer regarding the indications of the various tests. A properly designed abrasion test should indicate the action of the brick under the impact and abrasion of actual use and on its face is the most valuable test, if not the only one of really practical importance. If absorption is excessive, frost might have a serious effect upon brick, but within the limits shown on the diagram this effect may be neglected. The abrasion test would probably reject the brick in case the absorption were excessive. Bricks properly laid in the pavement are not subjected to transverse strain nor is their crushing strength ever approached. The results in the diagram, if arranged in order of rate of absorption, will show that specific gravity decreases as absorption increases. For the class of brick tested this relation will not be so definite in general.

IMPROVED PORTLAND CEMENT.*

By John W. Dickinson, M. Wes. Soc. E.

A perfect Portland cement is a product consisting of an intimate mixture of lime and clay-bearing materials, with the elements in exact and perfect proportions and free from any deleterious or even adulterating substances, all burned to a perfect clinker and the clinker ground to an absolute flour. Should the raw materials, even if of perfect composition, not be in a finely divided state or not intimately mixed, the chemical union of the different elements which should be accomplished by heat, is impossible, and the resulting product is simply calcined clay or calcined lime and not unground Portland cement, as it should be, and it would be immaterial how finely such so-called clinker was ground, it could never be Portland cement.

Marked improvement has been made in the last few years in the preparation of the raw materials. Instead of going to the kilns in a coarse, unmixed condition and with the different elements varying from 3 to 5 per cent. as was the former practice, and unfortunately is today in many mills, such precision is used in the best mills, that the raw materials are brought to a condition approaching impalpability, then thoroughly mixed, and by the use of improved methods and competent supervision the proportions of the chemical elements, viz.: lime, silica and alumina, are so controlled that the variation never exceeds one-half of 1 per cent. Great advance has also been made in burning. Bear in mind that the lime and silica in a Portland cement must all be chemically combined by heat, and to effect this combination, a great heat is necessary when the fluxing elements, alumina and iron, are kept at their proper minimum, and no product of the kilns that has not been thoroughly cindered and consequently chemically combined should be used with the clinker making the finished cement, and it is safe to state that owing to the improved process of burning adopted in the past few years, the proportion of underburnt material coming from the kilns has been reduced from 25 per cent. to 30 per

* Abstract from paper read recently before the Western Society of Engineers.

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cent., to less than 5 per cent., and in some cases the product of the kilns is invariably perfect clinker. The higher the percentage of combined lime the stronger the cement, and owing to the improved methods employed both in preparation of raw material and in burning, the lime has been increased from about 55 per cent. of the total to an average of 60 per cent., and in a few cases the entire process is so perfect that 65 per cent. of lime is successfully incorporated.

called cement represented by such residue is equally inert. Some investigators have reported slight strengths from the residue obtained by taking the intermediate of the 150 and 200 sieve, but I am positive that the strength thus obtained was wholly owing to the cement flour that adhered as dust to the coarse particles.

By improved grinding machinery 85 per cent. of flour is secured, instead of only 60 per cent., as was the case ten years ago. As adobe

ALEXANDER STREET, ROCHESTER, N. Y.

But it is probably in the matter of grinding that the greatest advance has been made. Perfect clinker is sufficiently hard to scratch glass, and it is evident to anyone that will take two pieces of clinker, say the size of large diamonds, and wet the surfaces, that on putting them together no bond will result. Now, if we break up one of these pieces and attempt to cement together even the smaller particles, we find that these are no more cement than

was superceded by lime, lime by natural cement, natural cement by Portland, so have the coarsely ground bicalcic-silicate Portlands of ten years ago been practically supplanted by the fine-ground tricalcic-silicate cements.

Cement work suffers more from careless and mischievous attacks during the first month than in any future twelve, so the quicker a cement sidewalk, floor, or foundation is hard and out of danger of

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a cement that will get its maximum strength in the shortest possible time.

Data were submitted showing the relative strength of an American and of imported Portland cements as determined by several engineers, and they showed in every case the marked superiority of the former.

In the lines of improvement may be mentioned:

1. Better preparation and more accurate mixing of the raw materials.
2. Uniform and complete incineration.
3. Fine grinding.

This country has taken the foremost position in Portland cement manufacture, equalling at least in the first particular any other country and in the second and third easily leading the world.

MANAGEMENT OF WATER-WORKS.

OUTLINE OF THE PROCEEDINGS AT THE ANNUAL CONVENTION OF THE AMERICAN WATER-WORKS ASSOCIATION.

The eighteenth annual meeting of the American Water-Works Association, held at Buffalo, June 14–16, was attended by over two hundred members and guests. It was one of the most interesting and pleasurable meetings in the history of the organization. The attendance was largely from the east, but many of the familiar faces from the west and south were there. The program embraced an unusual number of good papers and the local entertainment was most hospitable and generous, including trips about Buffalo, famous as one of the most attractive American cities, a visit to Niagara Falls, a trip to Syracuse, and kindly attentions in many ways from the Buffalo committee, of which Col. Francis G. Ward was the popular chairman. In appreciation of Col. Ward's efforts the delegates presented to him a handsome silver service. Addresses of welcome to the delegates were delivered by Hon. Conrad Diehle, mayor of Buffalo, Capt. M. N. Drake, M. J. Heeley, and M. Maher, commissioners of public works.

Mr. John Caulfield, of St. Paul, at the opening session, delivered his address as president, in the course of which he said:

Human society has, until our time, advanced with but tedious slowness along the paths which lead to the general well-being. Not until after a lapse of over twelve centuries, and even in a day that living men can recall, did the Christian world awake to the great truth that short of the teachings of the Divine Master Himself water was, and is, the greatest civilizing and refining influence brought to bear upon the lives and characters of men. The aqueducts of Greece and Rome, constructed only after centuries of barbaric destruction and decay had passed over the great canal waterways of ancient Egypt and Babylonia, did more than all the legions of the Cæsars, and more than the doctrines of half the sages of Greece, to make men see the divine possibilities of human existence.

With their destruction and decay in turn, Roman civilization, like that of Egypt, perished from off the face of the earth, and mankind again, for generations untold, sunk to the level of the devouring beasts. And in the intervals between the destruction and the re-building of the means of conveying water to man's habitation, history in its every leaf shows that there was neither growth nor true intelligence.

However we choose to regard the work of providing an adequate and healthful water supply for the large centers of population, we must be impressed with its gravity. The security of life and property alike depend on how that work is done. In

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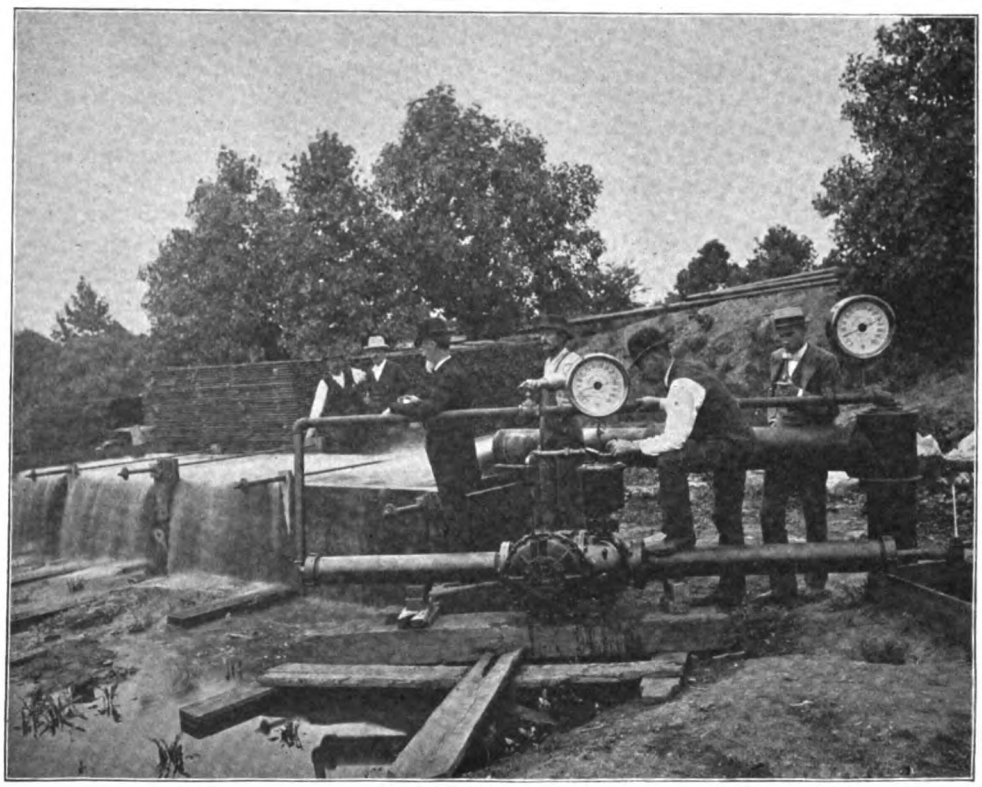
the entire domain of municipal government there is no other department but becomes trivial by comparison. Financial interests may become disturbed and even perverted; the loss is but a mischance of business life. The ordinary duties of official life may be neglected; taxes may mount to undue proportions; the source of representative government, the ballot, may become for the time polluted; even the seat of public justice itself may become tainted. But the remedy for all this is in the hands of the people themselves, to

until every city in the United States shall have at its disposal at the minimum of cost, and with the least expenditure of effort, a supply of pure and wholesome water vastly more than adequate to every exigency of municipal life; and beyond all possibility of the presence or the introduction of the slightest taint that might in the least interfere with the public health or comfort.

When that day comes you will see an end forever of fire and pestilence wherever men congregate—those twin enemies of



LIFTING WATER FROM WELLS WITH AIR.

apply before enduring injury has been done. All these wrongs may right themselves—nay, they have from time to time become righted—and no man has been worse off in any of the great requirements to human happiness and private and public contentment.

But let the water supply of a great city become deranged or polluted, and catastrophy impends. Life and property are imperilled, if not destroyed, and the very

civilization, against whose ravages human society had for centuries been engaged in a life and death struggle.

We must not expect to see this great end achieved without much trouble and disappointment. We are but the servants of the public and we are constantly to be confronted with the possibility of misunderstanding and suspicion on their part. In the delightful dispensations of partisan politics, those of us who can not soar to the

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ward caucus to the latest pronouncement of the judicial bench, but who know nothing whatever, and are incapable of learning anything of those vital interests which bring us together to-day in deliberative session. Doubtless many of you yourselves know how such things go. But we must be patient. Progressive as they are in their public, as in their private, concerns, the American people are slow to learn of their own advantage. But when they do learn, the lesson is not soon forgotten. Nor will it be long until they have thoroughly learned that the public man who will seek to bring the water department of a great city within the operations of party political strife, is a mere charletan, whose folly, if left unchecked, may develop into public crime.

The secretary reported the membership as numbering 355, embracing 286 active, 68 associate and 1 honorary.

The first paper was by Mr. F. A. W. Davis, of Indianapolis, under the title, "Some Information." It covered several subjects. His discussion of the financial reports of several cities is published in full in this number. He also referred to the decision of the Indiana Supreme Court, in the Fowler case, affecting the power of cities to buy water-works, and to some experiments relating to electrolysis. He also described the new reservoir of the Indianapolis Water Company, which is about 1,000 feet in length with an average width of about 50 feet. The covering consists of yellow pine boards 3½ ins. wide, resting on joists about 2 x 12 ins. The joists rest in turn on 6-in. wrought iron pipe, placed horizontally and supported by 4-in. cast iron pipes for columns.

Mr. Davis also made a statement of the result of tests in lifting water from wells with air. The well on which the tests were made [illegible] width 5 ft., depth 2 ft. 6 in., capacity 267 cu. ft., or 2,002.59 gallons; length of air line in well 90 ft., including 3 ft. of perforations, size of air line 2½ ins., air pressure on meter 36 lbs. Seventeen tests were made with a pressure varying from 35 to 47 lbs.; cubic feet of air used from 99 to 146 lbs., the time required to fill the tank varying from 1 minute and 35 seconds, to 3 minutes and 35 seconds. The short pipe gave the poorest results. The test by the 4-inch pipe was to ascertain if, by reducing the annular space in the 10-in., a greater flow of water would be obtained, but the results did not show it. In all of these tests the temperature varied only from one to two degrees at compressors and at well.

The temperature of water as it comes from the well is 54 degrees. The aeration of the water causes it to precipitate the iron rapidly. The air line was covered to the depth of about 1-16 of an inch in eight months' time.

Mr. William Himrod, of Erie, Pa., read a paper on the subject "Furnishing Water." It narrated many incidents connected with complaints regarding the quality of water at Erie, and gave an account of experiences with meters. Improvements and a large new cast iron intake pipe now give a satisfactory supply of water. The books of the water department of Erie are so kept that it can be known how each account stands at the close of each day.

Papers by Mr. W. R. Hill, C. E., of Syracuse, N. Y., on "Early Methods of Collecting, Storing and

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Wilkinsburg Water Co., which supplies a portion of Pittsburg and some outlying territory, showing that out of 1,000 metered customers, less than 65 per cent. use 6,800 cubic feet of water per year, which amount must be paid for whether used or not, and 10 per cent. used not over 2,800 cubic feet. He suggested 5,000 cubic feet a year as a proper basis for a minimum rate. About one-third of the meters failed each year until the company began filtering.

Mr. Hill said that in Syracuse, in 1897, there were 4,200 families whose total use of water did not exceed the minimum rate of 3,000 cubic feet per year, for $5.

Mr. P. D. Warner, of Reading, Pa., said that the tendency of the day seems to be first to filter and then to meter.

Mr. Gwinn, of Quincy, on the question of inefficient meters, said that his company used a 1-64 inch aperture for testing their accuracy.

In a paper on "Experience with Vegetable Growth in Ground Water," Mr. Owen T. Smith, of Freeport, Ill., described some experience with the crenothrix, an organism which forms in the suction pipes connected with driven wells, so that it can be pulled out in handfuls. The pipe is cleaned with a steel brush. It imparts a brown color to the water, and is said to be due to the sesquioxide of iron in the water. The water is exposed to neither light nor air before the growth takes place. The best advice that could be offered for a remedy was to find a water without iron.

Mr. S. A. Charles, of Lexington, Ky., read a paper on "Filtration and Aeration," which appears in this number.

Mr. S. E. Babcock, of Little Falls, N. Y., in a paper on "Compensating Reservoirs in Lieu of Compensation for Riparian Rights and its Legal Aspects," defined the rights of riparian owners in the water of running streams. In England it is common for authorities taking such water for public supply to build compensating reservoirs instead of paying damages to riparian owners. This practice is in accordance with an act of parliament. At Little Falls a compensating reservoir has also been built, and a large saving effected over what would probably have been fixed as damages under condemnation proceedings. This was done, however, under private contract, and after the city had bought some riparian rights and had obtained some advantage over the owner of the principal remaining one. Mr. Babcock presented figures of stream flow under maximum, average and minimum conditions, and also a line of argument designed to show that if only a sufficient storage capacity were provided to keep the stream up to its normal, dry weather capacity, riparian owners could demand no more. He also cited one American case where the court held that the diversion of flood water was not a ground for damages.

Mr. F. W. Cappelen, of Minneapolis, presented a report from the committee on pipe coatings, and on his recommendation the report on the same subject from a committee of the American Society of Municipal Improvements (published in full in MUNICIPAL ENGINEERING, November, 1897), was ordered to be included in the report of the proceedings of the association.

Mr. G. T. Latta, of Ludlow, Ky., described a method of which he is the inventor and patentee for introducing service pipes without

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trenching, being a process of hydraulic tunneling on a small scale.

Papers on "Free Water for Private Baths," by Mr. L. N. Case, of Detroit; "An Oil Filter for Boiler Feed Water," by Mr. Dabney H. Maury, Jr., of Peoria; and on "Cleaning Reservoirs," by Mr. Dow R. Gwinn, of Quincy, Ill., are published in full in this number. Mr. W. H. Laing, of Racine, Wis., described a stand-pipe and its brick casing.

Mr. H. E. Keeler, of the National Tube Works, Chicago, read a paper on "Municipal Franchises." In the discussion, Mr. Milne pointed out that within the meaning of the law a franchise is tangible property, with a definite earning capacity, and its value can be accurately computed. He believed that when water-works companies are in difficulty they should employ engineering skill, by which means they will discover their weak points, and go before a board of arbitration on a firm foundation, which will assure a fair valuation. Mr. Gwinn said that usually an opportunity was not afforded for arbitration, but that the opposition generally commenced at once to promote a duplicate plant, which, of course, means confiscation. There is no legal protection against this in any state except Pennsylvania, where a municipality can not engage in the business of water supply without first purchasing the existing plant.

The election of officers occurred on the second day of the convention, in accordance with the change in the constitution, and resulted as follows:

President—J. A. Bond, chief engineer of the Wilmington, Del., water-works.

Vice-Presidents—W. R. Hill, chief engineer Syracuse water-works; C. P. Allen, chief engineer Denver Union Water Company; L. N. Case, superintendent and secretary of the Detroit water-works; R. M. Clayton, city engineer, Atlanta, Ga.; J. D. Heim, superintendent of the Madison water-works.

Secretary and Treasurer—Peter Milne, New York City.

Finance Committee—D. R. Gwinn, Quincy, Ill.; W. H. Laing, Racine, Wis.; F. G. Ward, Buffalo, N. Y.

The convention closed with the trip to Syracuse on Friday. The party were taken to Syracuse on a special train, and were shown the Syracuse water-works. The ladies were entertained at a dinner, reception, and musicale at the Kanatenah Club, and the gentlemen visited the Century club, afterward attending a banquet at the Yates, where they were welcomed by Mayor James K. McGuire. In the talk at the banquet Mr. Hill was given credit for the success of the gravity water system of Syracuse.

The next meeting of the association will be held at Columbus, O.

EXAMINATION OF FINANCIAL STATEMENT OF MUNICPAL WATER-WORKS.

By F. A. W. Davis, Vice-President and Manager Indianapolis Water Co.

Having occasion to examine the domestic rates charged in some of the principal cities have made a rate that will be difficult to maintain, yet they may do so. The results

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$397,443.04, less the reductions of $6,231.82, leaving net $391,216.22.

While making an estimate on the basis of these figures, it should be noted that one hundred thousand dollars of actual expenses was to pay off bonds. The report shows that their pumpage product was 12,928,821,326 gals.; the cost was $391,216.22. Dividing the $391,216.22 by 12,928,821,326, we find that the cost per 1.000 gallons is 3.026c. Referring to their meter rate, we find that over fifteen thousand gallons per month is, per thousand gallons, 1¼c. Yet the cost of producing water is shown as above, 3.026c. The entire pumpage, if sold at 1¼c per 1,000 gallons, their lowest rate, would produce $161,610.26. Allowing that the $100,000 used to pay off bonds was a profit, and deducting that sum from the $391,216.22. would leave $292,216.22. Making the same calculation as above, we find that the cost per thousand gallons is 2¼c.

In the domestic rates we find that for a 30-foot lot where hose is used, the charge is sixty cents a year. In the report of '96 we find a statement that it was shown by tests that sprinklers used from four to thirteen barrels of water per hour. The average would be about eight and a half barrels per hour; at forty gallons per barrel, would be three hundred and forty gallons. Estimating that the average sprinkler is used 1½ hours a day, we have 510 gallons per day. Six days in a week would be 3,060 gallons for the week. Counting four weeks to the month, this would give 12,240 gallons per month. This water at 5 cents a thousand gallons, highest rate, would be 61 cents a month; six months would be $3.66. It would, therefore, appear that 60 cents is inadequate for a service that is uniformly recognized as an abused and wasteful service. The charge to manufacturers for the same quantity of water would be $3.66. On what theory could we furnish water for sprinkling service for less than we furnish it to manufacturers and other users by meter measurement?

It is further noted that the estimated receipts for this year will be $227,395; taking the expenditures, $292,216.22, being the actual less the bonds paid off, there would be a deficit of $63,821.22. It seems, therefore, that it will be necessary to add to the amount of the tax levy, which was $74,831.01, the deficit of $63,821.22, making a total tax levy of $138,652.23.

It is expected to make the property-owners pay for extensions. However, there are connected with every department some extensions of lines, increase in size of mains and purchases of new machinery with which property-owners cannot be chargeable, and it seems that these requirements have to be provided for through a general tax, basing our statement on the figures given. This brings us to the proposition whether or not it is fair to levy a general tax, to give water consumers low rates. There is no question but that every city should levy a tax to be paid to the water department because of the general service, such as supplying water to put out fires, cleansing sewers and other uses of water for the public. What such services are worth requires some consideration. The city received $74,831.01 for water furnished as mentioned above. The city in this case does not furnish fire protection, but furnishes water for the fire department, which must be provided with steamers to do the work of putting out fires. If the tax for such purposes is largely increased, the question arises, are the water rates as low as they appear to be. A greatly increased general tax makes it hardly fair to the non-consumer of water. It is certainly manifestly unjust to the water takers to charge rates that produce sufficient revenue to support the whole department. On the other hand, it is hardly just to reduce rates so that the man who has non-productive property must be taxed higher in order to give the water consumer a very low rate. This same proposition seems especially unfair when the tax is based upon valuations. A man may have a very large residence and not be a large consumer of water, which is furnished at a low rate, but his general tax may make his rate high.

In the Buffalo report, 1896, not having the '97 report, we find that this city is supplying water at a low rate, and to make up a deficit that would occur in the water department, is levying a general tax to pay for hydrant service and other public uses. This city's report, 1896, shows that the city had a deficit of $525,164.07. To cover this deficit, bonds were issued. The new rate which has been established will make an estimated reduction of 30 per cent.

The gross receipts of 1896 were		$641,807 56
30 per cent. of this sum..		192,542 26
Leaves		$449,265 30
The salaries were .....$	126,379 87	
Fuel	92,258 56	
Interest on bonds.....	158,779 25	
Repairs and maintenance	57,471 40	
		$434,889 08
Leaving a balance of		$ 14,376 22

for extensions, alterations, repairs and new machinery. It would seem that this city will be obliged to levy a greater tax than

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it has in the past for the requirements mentioned or increase the bonded indebtedness.

Their pumpage was 37,287,373,450 gallons, and estimating that it cost to produce the water $435,139.07, we find that the cost per thousand gallons is 1.166 cents and the lowest meter rate 2 cents.

The city of Minneapolis charges $1.30 per foot when the mains are laid, being 65 cents each side. There is also paid by tax levy the interest on the water debt. The cost of the works is given as $4,565,915. This sum at the rate of interest which is now being paid on the water bonds, $4.37, is $199,530 39
The operating expenses 99,809 99

Total cost $299,339 98

Taps in service, 14,349. Taking the above sum and applying to each tap makes the annual cost .....$ 20 86
The revenue received was..... 211,590 00
This applied to each tap would be... 14 74
Making a deficit per tap of..... 6 12

A house of five rooms is scheduled at $1.80 but it does not seem that this is the actual cost. To this we add the interest, 6 per cent. upon $19.50, the amount invested for pipe for a 30-foot lot, which is $1.17, making the cost $2.97, instead of $1.80.

The new ordinance of the city of Chicago assesses a frontage rate based upon the height and width of the property and for which rate certain water privileges are granted. The property not having water connections have a rebate of 50 per cent from the assessed rate. The street mains are paid for by the property-holders. The general rate of taxation in the city for all purposes, outside of an assessment for water, is $9.60 per $100. The asessed valuation may vary from one-fifth to one-eighth of the actual valuation.

It must be clearly understood that there is no disposition whatever to criticise the rates or business methods of cities named. The reductions and changes are such that the result will be noted with great interest, especially in view of the appreciation of the value of the water resulting from expensive purification methods that must be generally adopted.

There is no question but that just and equitable charges should be made to the city and citizens, but to arrive at them, direct and indirect charges should be taken into consideration.

EARLY METHODS OF COLLECTING, STORING AND DISTRIBUTING WATER.

By William R. Hill, C. E., Syracuse, N. Y.

Before attempting to review any of man's work in the art of collecting, storing and distributing water, it would be well humbly to bow to our Creator and acknowledge that all human contrivances are but faint imitations of nature's most wonderful and magnificent machinery. We find nature performing the duties of an immense hydraulic engine, requiring neither wheels, nor cranks, nor rods, nor pistons, continually converting water into vapor and pumping it into the atmosphere. In the night the dew gently settles over the surface of the earth and gives a sweet and refreshing drink to all the vegetable kingdom. At the dawn of day the sun's rays burst forth and silently and invisibly pump the water in perfect purity up to the distributing reservoirs, the clouds in the heavens, which are grand and beautiful in their formation, presenting the appearance of gigantic mountains crowned cannonading each other with electric fire, accompanied by vivid flashes of light followed by the loud reports of the discharge of their artillery. The winds distribute them in the heavens and affected by the temperature they fall in the form of rain, hail and snow to refresh the earth, to give drink to man, to give life to vegetation, and to form streams, lakes and rivers, the natural conduits that convey the water to the great storage reservoir, the ocean.

The subterranean boiler's water is heated by Pluto's blue sulphur flames, generating steam and producing power to operate nature's marvelous pumping machinery which discharges water from the bowels of the earth with a pressure sufficient to produce nature's amazing fountains, the geysers.

Water is purified by passing through natural filter beds, the subterranean strata of sand and gravel, and leading therefrom we

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tubes to the top of the highest tree in the forest, even to the end of the smallest blade of grass in the meadow. * * *

The remains of aqueducts in many parts of the world give evidence that the ancients were well provided with water. The supply was generally discharged into fountains placed in different parts of the cities and then conveyed by the water carriers to the dwellings or to wherever it was to be used. The aqueducts of the Greeks were open or subterranean channels. They apparently never constructed any aqueduct bridges, hence they left no conspicuous monuments of their works. They were unlike the Romans, who performed work with a disdain to obstacles, building immense structures of masonry to conduct water across deep valleys. Many of the bridges still existing, though in ruins, excite our admiration and astonishment.

In the year 312 B. C. water was for the first time conveyed to Rome from a distance. At that time Applus Claudius the censor constructed the Aqua Appia aqueduct from the Alban mountains, a distance of eleven miles. The channel was underground the entire distance with the exception of about 100 yards. In the first century, at the time of Emperor Nero, Rome was supplied with water by nine aqueducts, the aggregate length of which was 255 miles, with a capacity of over 200,000,000 gallons per day. After the construction of other aqueducts the capacity was increased to about 375,000,000 gallons per day. At the time of Constantine there were in Rome 926 public baths, 247 reservoirs and 1,212 public fountains. Many of the fountains were rich in works of art and were of a monumental character, and were dedicated to some god who was supposed to keep the water pure and undefiled.

France had many notable aqueducts. In the first century, in the time of Emperor Claudius Caesar, there was constructed a conduit from Mount Pila to Lyons. It crossed thirteen valleys on aqueducts and three valleys by inverted syphons. The first syphon was laid in a valley about 2,600 feet wide and 217 feet deep. The second in a valley 3,458 feet wide and 325 feet deep. The third was of considerably less importance.

The water was admitted on the upper side of the first syphon into a reservoir of masonry, in walls of which were inserted, at of the same diameter as at the commencement for a distance of eighty-one feet, and they then each divided into two pipes of six inches diameter. The eighteen smaller pipes were continued to the bottom of the syphon; but instead of descending quite to the lowest part of the valley they were carried across an irregular depression of the latter on an aqueduct of about eighty feet maximum height, so that in fact the descending limb of the syphon was only about 164 feet in vertical height and the ascending limb was about 142 feet. Midway in the ascending limb the two six-inch pipes were reunited into nine-inch ones, and the latter poured the waters they conveyed into a small reservoir corresponding with the one on the descending side. The descending limb of the second syphon was 282 feet.

The famous Bridge of Maintenon which was constructed in the seventeenth century, during the reign of Louis XIV., to convey water to Versailles is, without doubt, in point of magnitude and heighth, the most magnificent structure of the kind in the world. The bridge was about 4,400 feet long and over 200 feet high. It consisted of three tiers of arches, one above the other, of fifty-foot spans.

On the 29th day of September, 1613, water was for the first time conveyed to London from a distance. An open channel about eighteen feet wide and five feet deep was constructed from various springs near Ware and Amwell to the metropolis. Although the distance in a streight line was not more than twenty miles, yet the conduit by its circuitous route was forty miles in length. This length was preferred in order to obtain a fall of three inches per mile throughout its entire course. Later on the channel was shortened to a length of twenty-eight miles. The valleys were in most cases crossed by timber aqueducts, the water ways on which were lined with lead. These timber aqueducts were replaced with embankments about the year 1785.

The canal that supplies the city of Marseilles with water was constructed during the years 1839 to 1847. It is among the boldest undertakings of the kind in Europe in modern days. It has a capacity of 285,000,000 gallons per day. The water is conveyed about sixty miles through forty-five tunnels of an aggregate length of eight and one-half miles, and across many valleys by

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in the French province of Artois, anciently called Artesium, hence the name artesian is derived. At Aire, in that province, there is a well from which the water has continued to flow steadily to a height of eleven feet above the ground for more than a century. There is a flowing artesian well within the old Carthusian convent at Lillers that has been in steady operation since the year 1126. Unmistakable traces of much more ancient bored wells appear in Asia Minor, Persia, China, Egypt and even in Sahara. At Grenello, in the vicinity of Paris, there is an artesian well which is 1,798 feet deep. It discharges water at the rate of about 850,000 gallons per day and at a temperature of 82 degrees Fahr. The boring of this well commenced in the year 1834 and was completed in the year 1841. Previous to the latter date no well had reached a depth of 1,000 feet. The well at Passy, near Paris, is 1,923 feet deep. At its bottom it is two feet and four inches in diameter. It throws a continuous stream of water, at the rate of about 5,500,000 gallons per day, to a height of about fifty feet above the ground. At Bourne, England, there is an artesian well ninety-five feet deep, which yields over half a million gallons per day, with a pressure sufficient to supply the town and to force the water to the tops of the highest houses.

The older cities of Germany were the first to use pumps to raise water for public purposes. There they were quite commonly used in the year 1550, operated by water wheels. We have no information in detail of their construction. Pumping engines were first used in London in the year 1582. Water was raised from the Thames river to an elevation of 120 feet by sixteen force pumps. The pumps were operated by two undershot water-wheels placed under the arches of the London bridge. The wheels were twenty feet in diameter and were turned by the current during the rise and fall of the tide. When the water flowed rapidly the wheels make six revolutions per minute. The plungers of the pumps were seven inches in diameter and had a stroke of thirty inches, and for every revolution of the wheels they made two and one-fifth strokes. The pumps had a total capacity of 2,500,000 gallons per day. About the year 1757 one of Newcomen's steam engines was erected to raise the water at ebb tide when the Bearers, who brought water from the adjacent river in leather panniers slung on the backs of horses.

The atmospheric or sucking pump was invented in the year 1641. It was a mystery at that time why the pump would not raise the water higher than thirty-two or thirty-three feet. Two years later Torricelli discovered that the water was raised in the barrel of the pump by air pressure on the surface of the water.

The most complicated machinery ever constructed for raising water was erected and set in operation at Marli, near Paris, in the year 1682. The pumps were divided into three groups. The first set contained sixty-four sucking and forcing pumps, raising the water 160 feet directly from the Seine river, through an iron pipe, to a cistern 600 feet from the river. The second set, seventy-nine pumps, were placed at this cistern and raised the water 185 feet to a second cistern 1,344 feet from the first. The third set, eighty-two pumps, were placed at the second cistern and raised the water 188 feet in a distance of about 2,000 feet to a reservoir. Therefore, the water was raised 533 feet in a distance of nearly 4,000 feet.

The pumps were operated by water power from the Seine river, which was divided into fourteen distinct water courses, in each of which an undershot wheel was erected. The first set of pumps was operated by six wheels, while the remaining wheels transmitted power to vibrating levers and through these to the piston rods of the second and third set of pumps. Therefore, the upper set of pumps was stationed 345 feet above and 1,944 feet distant from the power that operated them.

The feasibility of raising the water directly from the river to the reservoir was demonstrated by an attempt made in 1738, but owing to the inability of the machines to stand the strain they were operated as before until the year 1775, when a trial was made to dispense with the first cistern, but the pipes burst and the old plan was resorted to until Napoleon ordered a steam engine of sixty-four horse-power to replace the water-wheels. Consequently these pumps were in use and operated by water power for a period of at least 100 years. The hammering, rattling and creaking noise of the working of this machinery has been described as something hideous. It would be

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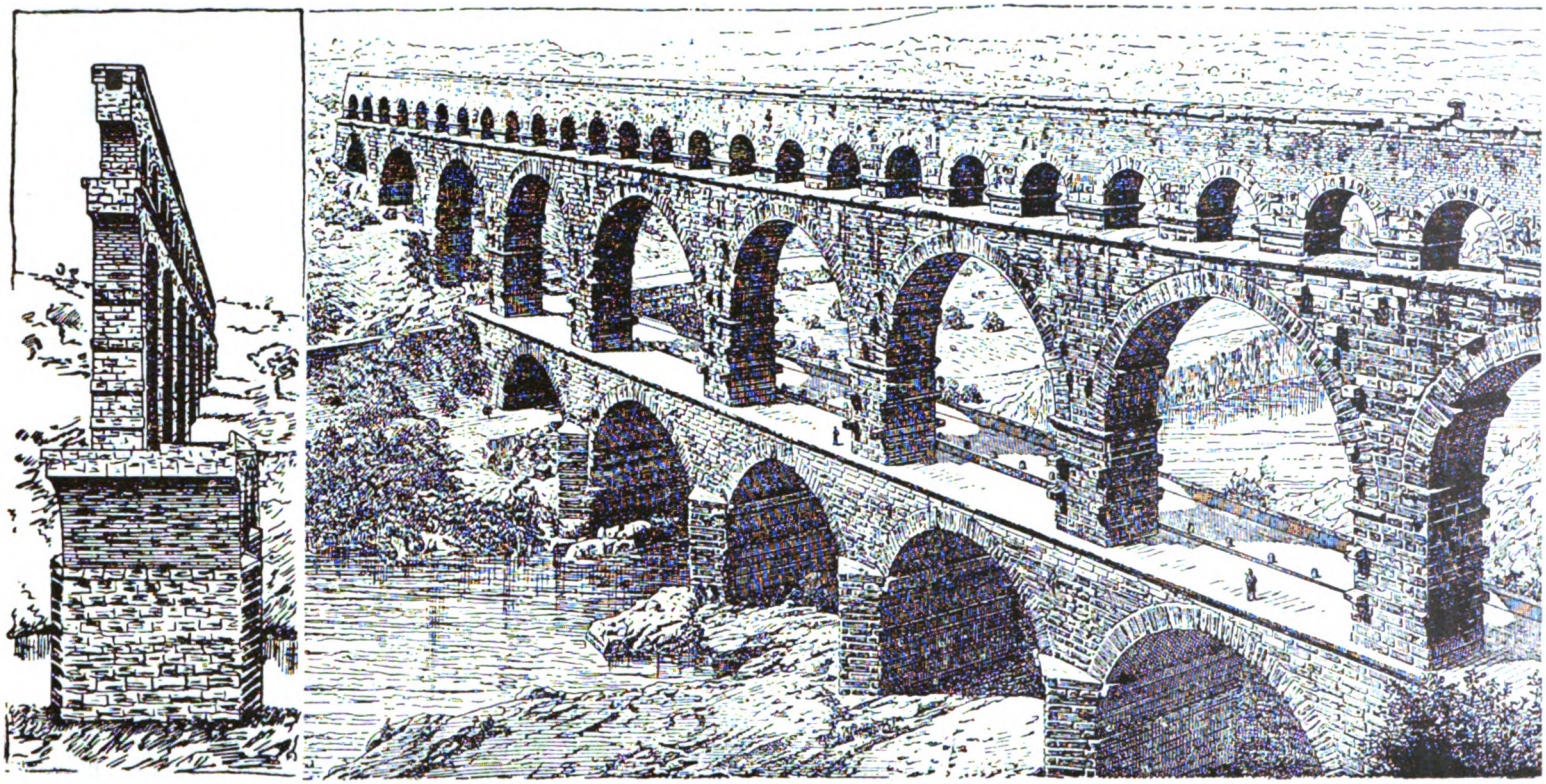

This section made from the accompanying view by Thomas McE. Vickers, C. E.

THE PONT DU GARD AQUEDUCT OVER THE RIVER GARDON, NEAR NISMES, FRANCE.

It is 180 feet high and 873 feet long. The channel is about five feet high and two feet wide. Supposed to have been built 19 B. C.

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were put into operation January 27, 1801. An engine was placed at the corner of Schuylkill, Front and Chestnut streets. The water was pumped from the Schuylkill river into a brick aqueduct which was six feet in diameter and 3,144 feet long, leading to the Center Square engine house at the crossing of Broad and Market streets. Here another engine pumped the water into two wooden tanks set in the top of the building fifty feet above the bottom of the brick tunnel. The tanks were ten and fourteen feet in diameter and twelve feet deep. The engine could not fill them in less than twenty-five minutes. The pumps were double-acting force pumps. They were made of wood and lined with sheet copper to prevent leakage. The steam cylinder of the Central Square engine was cast in two pieces, united by copper. The joint was secured by a cast iron sleeve eighteen inches wide. The cylinder was thirty-six inches in diameter and six inches long. Nearly four months were spent in boring it. The steam boilers were made of five-inch white pine plank. They were boxes nine feet high, nine feet wide and fifteen feet long. They were securely bolted and braced. Inside of each was a wrought iron fire-box with vertical cast iron flues. The lever-beams, shafts, fly-wheels, etc., were also made of wood. The water was distributed through the city in pipes of bored logs six inches and four and one-half inches in diameter. Construction of the works commenced in the year 1799.

In contrast with these early contrivances it is interesting to note that there is perhaps no engine in the world which has a capacity equal to that of the pumping engine "Michigan," which was built from designs of Mr. E. D. Leavitt. It has a capacity of 60,000,000 gallons in twenty-four hours against an average head of fifty-one feet. It is located at the Calumet and Hecla Stamp Mills, Lake Linden, Michigan.

The first person who is known to have raised water by a water ram was Mr. Whitehurst, of Derby, England, in 1772. He conveyed water through a one and a half-inch pipe a distance of about 600 feet with a fall of sixteen feet to furnish water directly to the lower part of a building. When a faucet in the building was opened the water in the pipe was set in motion and as soon as the faucet was closed the momentum of the long column of water opened the check value and part of the water after the year 1796. By using two or more rams and connecting their ascension tubes into one, water has been raised at Marli, in France, to a height of 187 feet.

The origin of the syphon is lost in antiquity. It was, however, used in Egypt as early at least as 1450 years before Christ. In the tomb of Amunoph II., who reigned in that period, there is a delineation which represents the syphon apparently in operation drawing liquid from one vessel to another. A syphon of extraordinary size was built for the Quindaro water supply of Kansas City. It leads from the intake crib to the pump wells, a distance of 745 feet. It is forty-two inches in diameter; its rise is ten feet above low water and its capacity is about 50,000,000 gallons per day.

A conduit discovered near Patara was formed of stone blocks about three feet square, through which a tube about thirteen inches in diameter was cut. On one end of each block there was a projection which fitted into a recess three inches deep in the face of the adjoining stone, forming a socket and spigot joint which was filled with cement. The blocks were secured together by iron clamps run with lead. The date of the construction of this conduit is lost.

Great and important advances in the science of engineering in the methods of distributing water have been made through the manufacture of pipes. The ancients, so far as we know, made only a limited use of pipe. Although the Romans carried their systems to a high degree of perfection, they preferred brick or stone conduits to lead pipe, which was the only metal conduit they had at their disposal, excepting a bronze pipe which was difficult to manufacture. These lead pipes were made in lengths of ten feet by bending sheet lead upon a cylindrical form and soldering the edges. Thus they were ill-adapted for the conveyance of water under pressure. Earthenware pipes were also used. Some were made to screw into each other. Most of the great houses or palaces were supplied with water which flowed constantly into basins of stone of marble. Water was rarely carried by pipes to the upper stories. A lead pipe of great antiquity was recently found under the street in Rome. The pipe was not less than two feet in diameter. It was re-enforced in ancient brick masonry.

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were laid down in considerable quantity in London and in Manchester in the early part of the present century. The result in each case was a disastrous failure.

In the early days of London's water supply the distributing mains were made of bored trunks of elm trees, and in most cases they were six or seven inches in diameter. Owing to their small capacity it was necessary in many cases to lay additional lines. In the year 1810 there were nine lines laid side by side in one street. At the end of the last century they commenced to use cast iron pipe. About twenty miles of wooden pipe were removed annually until the year 1820, when all the mains of the New River Water Company, about 400 miles, were replaced by others of iron, of diameters from one to three feet. The cast iron pipes were screwed together at the joints. This prevented their free expansion and contraction, and often caused them to be broken by the varied temperature of the water, rendering them very defective in the winter season. Cylindrical socket joints were then introduced. They were accurately turned in a lathe. No stuffing was used other than a little whiting and tallow. The pipes were driven up in the joints. They were made in lengths of nine feet. The service connections were made by flanged joints cast with the pipe.

Until about the year 1850, or a little later, London and many of the principal cities and towns in England were supplied by the intermittent method, the water being turned on and off in the mains once or twice a day, or once in two or three days, as the case may have been, to fill tanks in the houses. Liverpool had an intermittent supply until the year 1873.

The first improvement on the ancient method of making lead pipe was in the year 1539 in England. It was then cast in an upright position in short lengths. The lengths were united in a mould by pouring hot metal over the ends until they were run together. Later on lead pipes were made by casting them in moulds laid in a horizontal position. After a short piece was cast it was almost entirely drawn from the mould. The mould was then refilled with hot metal which fused with the first piece and increased its length. It was then partly withdrawn and more metal poured, increasing the length as before, and so on until the pipe was made the required length. The present method of making lead pipe was patented in England in the year 1820.

The process of making wrought iron tubes was invented and patented in England in the year 1824. These have been extensively used as service pipes, but in many cases, owing to the nature of the water, they have soon corroded and leaked. In other cases oxidation and incrustations have seriously diminished the capacity of the pipes. Many experiments of coating the pipe have been made from time to time with a view of preventing its deterioration. The most durable and effective coating appears to be a lead lining. The lead lined iron pipe was first made about ten years ago. The method of making it is as follows: A reamer is run through the iron pipe making it smooth and true. It is then heated. The outer surface of the lead pipe is covered with a cement and then drawn into the iron pipe, followed by an expander which runs through the pipe its entire length. Wrought iron pipes are lined with tin in the same manner.

The water meter was first patented in England in the year 1825, and in America in the year 1848. Where it is used it restrains a great wastage of water. Many cities have erroneously demanded an unnecessarily large supply of water and have unduly increased their works by building reservoirs, conduits, pumping stations, etc., while, if all their services were metered, they would find that the supply first available would serve a population two and three times as large. The meter is a great economizer. It saves many thousands of dollars in the cost of pumping. It is an honest arbitrator between the supplier and consumer, and it is a better inspector than the most competent man.

In conclusion, it is my hope that this and future generations may enjoy many improvements in the art of collecting, storing and distributing that beverage which is provided by our Creator to cherish and invigorate His creatures and to beautify the world.

WATER METERS AND RATES.

By John B. Heim, Superintendent City Water-Works, Madison, Wis.

Ten years ago the prejudice against the the measuring of water was so strong that it often cost the official head, if insisted upon. Because of the rapid strides and satisfactory results of the meter system since then, wherever adopted, it ought not to be as difficult to procure its introduction now. A careful and shrewd business manager cuts off all unneecessary waste, and at the end of the year finds his gains. Why should he not do the same with the water? Because it appears that the water drawn from the lakes or rivers seems plentiful, and therefore ought to be free as air, is not good

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reasoning. People forget that it requires machinery and fuel to pump and furnish water, and that every gallon costs money. There is no need for stinting the plentiful use of water, and the rates can be fixed accordingly. The mission of the meter is not to deprive us of plenty of water, but to prevent its waste. The tendency of all of us is to get as much as we possibly can for little or nothing; we always want the lion's share, if only some one else pays for it. Indirectly, we probably pay double for it.

To my utter astonishment, I noticed in the water works journals of last July, that a citizens' committee of Savannah, Ga., petitioned its water commissioners to abolish the meter system, claiming that the meter system tends to restrict the legitimate use of water, thereby endangering the health of the city, and aside from that, that their meters were so defective as to give rise to serious irregularities and injustice. From statements given, the city owned and had placed 200 meters on one street, controlled and repaired them. After giving this committee a hearing and investigating the charges, the commissioners decided to abandon the meter system and to return to the old plan of assessing the rates. Can it be possible that after investigating these charges, such should be the outcome? It is stated that the supply is drawn from deep wells and the water is of excellent quality. Nevertheless, they abolish the meter system, knowing that such a supply is limited.

It is a mistaken idea that a meter system restricts a legitimate or a plentiful use of water. There is not a water works in existence that has adopted the meter system that for one moment desires to restrict the use of water for necessary purposes and plenty of it, desirable from a sanitary standpoint. Their only aim is to restrict the careless waste and leaks. We find in our city that the water meter is a fairly accurate instrument, and we are anxious for the day when every tap is metered. We teach our takers how to read the meter; we purchase only the straight-reading meter, so that any one in the family can read it, and we ask them to read it when we find an unmeasurement is the only fair and just principle. The careful person, as well as the extravagant, gets value received. Under the schedule rate, the careful person pays for the extravagance of the other. Under the meter system, if a taker has a large lawn, takes pride in it, sprinkles all day, he pays for it the same as if he desires the best in the market for which he is willing to pay. Under the schedule rate the other takers are obliged to assist him in keeping his lawn fresh and green. Our meter system is now in its tenth year and very popular. Should we decide to go back to the schedule rate, there would be such an uprising in opposition that woe be to the man who would father it.

Our schedule rates are: For a six-room house, $5; one water closet, $2.50; one bath tub, $3—$10.50 per annum. At this rate we collect for the first six months in advance, for a new building or an old service, where a meter has been placed; after that per record of the meter the preceding six months. We close our records the first of June and December, to be ready for collection by the first of January and July. Here is where we discover the great objection to the schedule rate. We considered our schedule rate, before adopting the meter system, a very low one, but the meter rate brings the water rent considerably less, where there is no waste, and naturally the patrons want the lesser rate. Another objection to the meter system is the fear of financial results. We will give you a few illustrations of our experience and you can judge for yourself.

1. In 1888, when we adopted the "General Meter System" and commenced placing the meters, at the expense of the city, we discovered some very great leaks. The leaks were not repaired for several days, so that we could see what they amounted to: I will only mention three. In one instance the city received under the schedule rate $12 per annum, the waste under meter amounted to $600 per annum; the annual average payment now, under meter, with more fixtures, is $42.48. Another instance: The annual schedule rate was $32, the waste was $912, the annual average meter rate now is

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In the month of December, 1886, we had 980 takers; we pumped 25,517,200 gallons of water. December, 1896, with 2,334 takers, we pumped 24,092,500 gallons, a difference of 1,424,700 gallons less than in 1886. In January, 1887, 980 takers, we pumped 23,450,100 gallons. January, 1897, 2,334 takers, we pumped 25,458,000 gallons; 2,008,000 gallons more than in 1897. July, 1887, 980 takers, we pumped 24,239,500 gallons. July, 1897, 2,334 takers, 27,845,500 gallons; 3,606,000 more than in 1887. August, 1887, 980 takers, we pumped 25,917,500 gallons of water. August, 1897, 2,334 takers, we pumped 22,487,500 gallons; 3,430,000 gallons less than in August, 1887; only 760,000 gallons more in 1896-7, with 1,354 more consumers and an estimated free water of 131,000,000 gallons of water, against 35,000,000 gallons in 1886-7. The average pumpage per day in 1887 was 715,885 gallons; in 1897, only 794,446 gallons. In 1887, with a minimum of $6 per annum, 980 takers and no meters, we collected $13,479.69. Last year, with a minimum of $4.50 per annum, 2,071 meters and 2,334 takers, we collected $21,471.64.

Our consumption of coal in 1887 was 1,124,200 pounds, or 1,148 pounds for each taker; last year it was 1,470,600 pounds, or 630 pounds for each taker. We commenced placing our meters on the 21st of May, 1888; on the 1st of October we had 210 placed. We therefore cannot consider this year in the saving of fuel, but as we checked some very flagrant wastes I have brought it within my calculations on the actual saving.

During these ten years, averaging 207 meters added each year, the actual saving on fuel was $16,893.19, a saving of over 44 per cent. on the investment of meters. Last year the saving on fuel was $2,066.82, our coal being $3.99 per ton, against an average of $5.25 per ton heretofore. In 1887 we pumped for each taker 266,642 gallons. In 1897 only 124,667 gallons, less than half, and including over 4 per cent. more free water.

3. Another illustration of the reform that the meter system has brought about is in collecting water rents. One patron under the schedule rate paid the city $22.50 per annum; a meter was placed, and the first monthly reading showed a leak. The patron was notified; he insisted it was the meter and wanted it removed, which, of course, was not done. When he came to pay the water rent, he found a bill of $15.94 for six months, and he again insisted it was the meter. We offered to test it, let him supervise it in every shape or manner and if the meter did not register exactly he would not have to pay a cent. He accepted our offer, tested and found our statement correct, but being still unsatisfied, asked for another meter. We gave him another, but this meter showed the same leakage. Then he followed our advice, found the leak and repaired it, and his average water bill since (now nine years) has not been over $15.34 per annum.

In another instance, where the general average was between $3 and $4 per annum, a leak occurred; no attention was paid to us; bill amounted to $27.38 and had to be paid, and is now back to its original average. Again, three tenements on one service; three separate meters independent of each other, same fixtures to each: One paid $4.50, the other $9.03, and the third $24.31 per annum, the latter a very careless tenant, indifferent because the landlord paid the water rent. The three are now down to $4.50 per annum each. Another tenement family during three years paid on an average of $13.18 per annum. This family moved out and a new family moved in. The water rent advanced to $16.01 in six months; allowing the water closet to run continually. The next bill was only $5.20.

Another house rated under schedule $20.50 per annum; the meter reduced it to $14.37 on an average. A new servant took a notion to let the water run, and increased the bill to $22.81. It is now back to the original.

One other objection to the meter system is the free water craze. The cry is, water should be free as air. Such it is when vouchsafed to us by a kind Providence in the form of rain or snow, but it also requires the energy of the elements through the laws of nature. If we have a well at our doorside, it costs money to build and repair the same. When we desire to enjoy a boat ride and we are in the midst of a river or lake rowing the boat, and we want a drink, it costs us twenty cents or more an hour, unless we carry the nut brown beverage with us, which is still more expensive. When we lay water mains, with wells or the water supply from mains near at hand, it costs 50 cents a day for a water boy. Where is the water free as air? The operation and mode of supply must be paid for by those who get the benefit, and the rates must be fixed accordingly. Let us compare our city, with a population of 17,884, supplying 73 per cent. of our inhabitants, with another city not a great distance from us, with a population (census 1895) of 28,769, supply only 50 per cent. of its inhabitants, where they have no meter system and the water seemingly is as free as air. They have 2,908 takers, 574 more than we have, and four miles more of mains. Their annual pumpage was 1,627,852,100 gallons during the year; we

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pumped 290,972,750 gallons, only a slight difference of 1,336,879,350 gallons more than we pumped; their daily average was 4,459,870 gallons, against our 794,446 gallons; their per capita is 155 to our 45 gallons per day. They consumed 3,857 cords of pine slabs, at a cost of $5,586.54. We consumed 735 tons and 600 pounds of anthracite pea coal, at a cost of $2,933.85, a difference of $2,652.69, not considering the kind of fuel. They expended $32,000 in new pumps, and they are inadequate; we invested $38,000 in meters, of which we have already saved over 44 per cent. in their cost on the fuel, and will increase that saving from year to year. When fire pressure is demanded of us, the water is not oozing from a thousand and one openings, reducing our pressure, crippling our usefulness and weakening us when demand is made upon us in case of a large conflagration. The free-water people forget that they are standing in their own light and are paying for this free water indirectly and might be so unfortunate as to suffer a great loss by fire through the want of fire pressure.

Another very difficult problem to solve is that of meter rates. We have made the rates a study for years. With the best intentions, we are bound to do injustice to some; therefore our endeavors should be in the direction of the least possible injustice. The three most difficult, and at times very expensive, parts to be considered are the source of supply, filtration, and the fuel. Our water supply is from artesian wells; therefore, filtration is not in our consideration, but the fuel bill plays an important part. Our pumping station being located in the residence portion, in the midst of a park, surrounded by costly dwellings, we are compelled to use hard coal. The average cost of our coal for the past ten years has been $5.25 per ton. Our annual operating expenses average between eleven and twelve thousand dollars. Therefore, with the above considerations in view, we fixed our meter rates. First, we established a minimum rate. Second, we decided that every taker, whether large or small, should pay for the first 5,000 cubic feet the same rate; after that a sliding scale for the benefit of the large takers and in proportion to the use, viz.: If a party consumes 90,000 c. f. in six months he pays for the first 5,000 c. f. $10; for 10,000 c. f. $15; for 20,000 c. f., $25; for 30,000 c. f., $30; for 40,000 c. f., $33; for 50,000 c. f., $36; for 60,000 c. f., $39; for 70,000 c. f., $41; for 80,000 c. f.. $43; ulation, we cannot sell water at less than 5 cents a 100 cubic feet at the present time. We sell by the cubic foot because it is indicated so on the meter; the takers can read the registration and govern themselves accordingly. Our rates are:

First 5,000 cubic feet or less, per six months, per hundred cubic feet, 20 cents.

Over 5,000 cubic feet and up to 20,000 cubic feet, per six months, add $10 for first 5,000 cubic feet and 10 cents for each additional 100 cubic feet.

Over 20,000 cubic feet and up to 30,000 cubic feet, per six months, add $25 for first 20,000 cubic feet and 5 cents for each additional 100 hundred cubic feet.

Over 30,000 cubic feet and up to 60,000 cubic feet, per six months, add $30 for first 30,000 cubic feet and 3 cents for each additional 100 hundred cubic feet.

Over 60,000 cubic feet and up to 90,000 cubic feet, per six months, add $39 for first 60,000 cubic feet and 2 cents for each additional 100 cubic feet.

Over 90,000 cubic feet, per six months, per 100 cubic feet, 5 cents.

Minimum, per six months, $2.25.

The method of figuring under these rates is very simple, as examples will show, to-wit: A patron having consumed during six months 7,316 cubic feet, deduct the first 5,000 c. f., which cost $10.00, multiply 2,316 c. f. by 10 cents, $2.32, add the $10.00, and the bill is $12.32. If he consumed 16,789 c. f., deduct 5,000 c. f., multiply 11,789 by 10 cents, $11.79, add $10.00, equals $21.79. If 26,382 c. f., deduct 20,000, which leaves 6,382 c. f. at 5 cents a 100 c. f., $3.19, add $25.00, and the bill is $28.19. If 50,110 c. f., deduct 30,000 c. f., multiply by 3 cents, $6.03, add $30.00, equals $36.03. If 78,999 c. f., deduct 60,000 c. f., leaves 18,999 c. f. at 2 cents a 100 c. f., $3.80, add $39.00, equals $42.80. You will note that by this method every cubic foot is considered and the assistance given to the larger taker according to his business and demands.

We adopted these rates two years ago, and they have been very satisfactory and met with general approval. There is the least disinclination, and no encouragement to waste water to get a lesser rate. Our experience has taught us the idea that there ought not to be a flat rate. Each taker, whether large or small, to pay the same rate would be a gross discrimination against the larger taker, and result in a

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the fuel, per ton of coal or cord of wood; that is to say, if we had to pay for 600-800-1,000 or more tons of coal or cords of wood to pump the water the same price it costs us for our own private use, what would be the result? Who would pay the difference? Would not the taker? The small as well as the large taker derives the benefit of the lesser cost in fuel. There must be a minimum rate, as it costs as much to take care of a small as it does of a large consumer. If we purchase a half ton of coal the cartage is the same and the labor nearly so as if we had purchased two tons. It is so in all commercial lines; why should it be different in the sale of water?

I trust that I have added in a small way another solution of the great problem that baffles so many water works officials—that of securing an abundance of water at a lesser cost, lesser in the avoidance of the purchase of pumping machinery, lesser in the cost of filtering the supply and better able to secure a pure and wholesome water from artesian wells in smaller cities. The meter is the detective, the guardian, the adjuster, the salvation of the water supply and of the finances. A thorough trial of the meter by the water works officials and by the citizens will soon convince them that the only fair and just way to sell water is by meter measurement.

CLEANING RESERVOIRS.

By Dow R. Gwinn, Superintendent Water-Works, Quincy, Ill.

Cleaning a reservoir is not the kind of a job that one is anxious to do, but when the necessity exists the sooner it is done the better. If the reservoir has a hard, smooth bottom, with sufficient fall to the waste pipe to carry off the mud and water rapidly, the task is not a difficult one. The writer has had experience in cleaning two reservoirs; one is used for settling purposes in connection with a filter plant, and is 70x70 feet, 7 feet 6 inches to 9 feet six inches deep, with a fall of 2 feet from the point most distant to the waste pipe. After using for several months it is necessary to wash out the sediment, which at the point of inlet is usually about 4 feet 6 inches deep, the balance being covered to a depth of from 12 inches to 7 inches deep. After the reservoir has been drained, pumping is resumed, the filters being supplied direct from the pump, and the surplus water used for washing the mud. With nine men the sediment is removed in about three hours. The other reservoir is used for storing filtered water, and is 246x343 feet at the bottom, 25 feet deep. The bottom is of clay puddle, nearly level, except within a radius of 30 feet of the waste pipe, where the fall is about 18 inches in that distance. The inlet has been changed, but at the time of the clearing it was in the southwest corner while the opening into the waste pipe is in the northwest corner, or directly opposite with water pumped into the reservoir at the inlet and have plenty of laborers to stir the mud in the stream of water as it flowed to the waste pipe. While the reservoir was empty the city was supplied by direct pressure; the inlet valve is 20 inches in diameter, requires 196 turns to open, and while cleaning was being done it was open 12 turns. To prevent any damage from suddenly increased pressure or water hammer, the hydrant near the reservoir was opened, and to it was attached 150 feet of 2½ inch hose, laid to the top of the reservoir embankment. To move and stir the mud 20 laborers were employed, who were provided with wooden scrapers such as are used to scrape snow. We tried several sizes, and found that the men did the best work with the board or blade 8 inches wide and 1 foot 6 inches long, the handle being 1½ inches square. In cleaning a reservoir in this manner it is of the utmost importance to wash that portion of the reservoir first which is not on the natural route for the water from the inlet to the waste valve. We began by making a channel in the mud about 8 feet wide, commencing at the inlet and running along the foot of the south bank, continuing along the east bank, thence along the north bank to the waste pipe in the northwest corner. The mud from this channel or trench made a kind of embankment, which

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puddle began. Once away from the bank it was necessary to confine the water where needed for washing; to do this we used 2 inch and 3 inch planks 1 foot wide and 20 feet long, placed on edge and end to end; near the end of each plank was nailed a triangular board, which held the plank on edge.

In preparing to clean a section two lines of these planks were used, and they were placed parallel, about 8 feet apart; the upper end or inlet started at the open trench along the east bank, and the lower end or outlet was near the waste pipe. The water was then admitted into this section, and the mud scraped along with it as it flowed to the waste pipe. When this space was cleaned the boards were moved south to the next section, and so on until the whole surface had been cleaned. The planks when in position were bedded into the mud and puddle with a maul, a few strokes being necessary on each plank. Where the pressure on a particular plank was unusually heavy a stake or two was driven on the lower side. Iron clamps made of ⅛ inch iron 6 inches wide, shaped like a letter "U," say 10 inches long, to go over the joints where the planks come together, would be of service in keeping the line intact; stakes would not be necessary if clamps were used.

Considerable time could be saved by having sufficient boards to make three lines, so that one set of boards could be moved ahead, and as soon as one section was washed another would be ready for the water to be admitted. As stated before, the average depth of the mud in our reservoir was 9 inches, and what has been written applies more particularly to that depth, but if the mud was much deeper it would not be necessary to have a row of planks on the side in the direction in which the work was moving, as the material itself would be a sufficient dam. We learned that it was desirable to keep the mud from drying, as it washed much easier when soft, and at night the waste pipe was closed and sufficient water admitted to flood the bottom. There were 2,000 cubic yards of mud removed, and the time required was eight days. The expense of removing the mud, including the cost of planks, rubber boots, etc., but exclusive of water, was 15 cents per cubic yard. The amount paid for labor was about 10 cents per cubic yard.

CAST-IRON PIPE INSPECTION.

By W. T. Yardley, of Chicago.

The importance of a careful inspection of cast iron pipe for water works has grown in the past decade so materially that few engineers and superintendents are willing to accept pipe from the maker's standpoint of excellence. This is not to be wondered at, when we know the inspector in the employ of the company making the pipe has but one interest to subserve—that of his employer. If the maker of pipe would require from his inspector the same care that an outside inspector takes in the interest of the purchaser there would be very little use for an outside inspector. There are many points for an inspector to watch carefully, and it is not surprising that an employe of the maker should overlook some of the most important ones. For instance, pipe made in cold weather should not be taken from the casting pit while showing the color of heat; if so, internal strains will exist if the shell is of uneven thickness, and to the detriment of the life of the pipe.

There is no metal so unreliable as cast iron states refuse to take any pipe from a day's cast that shows from ten to twenty per cent. rejections, for the reason that no one can tell how near the danger line the accepted pipe may be; while the accepted have passed all careful inspection it is not a sure thing that the accepted pipe will stand in case of a water ram that is liable to occur at a fire, when a valve may be closed suddenly. The force of the blow under these conditions will be of greater force than the hammer test when the pipe is filled with water, free of air, and subjected to a pressure of 250 pounds per square inch. Inspection of pipe is of no value to the buyers unless well done; it is simply money thrown away. Fifteen years ago there were very few inspectors sent to pipe works to look after the interest of the purchaser; during that time many mechanical devices have been introduced which have cheapened the cost of production and enabled the makers to increase their output; but these devices do not insure regularity in thickness of shell or per-

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if he does his duty he will look after this, and it is for this that the purchaser pays for careful inspection. The cost of inspecspection is so reasonable that no water company should hesitate regarding the employment of competent inspection. The railroad companies, as a general proposition, have all the rails and splice bars purchased inspected. After years of such experience these large interests have almost unanimously united on the value and importance of good inspection. This is so with water works companies, but more important to the latter for the reason that pipe are under ground and, therefore, cannot be looked after so well as the rails and appliances above ground. As pipe lines are extended the pressure is often increased, and therefore the more important that pipe should be of uniform thickness of shell and free from imperfections due to careless cooling, etc. In many towns direct pressure from the pumps is secured, often running the pressure up to one or two hundred pounds pressure per square inch.

At the time of the fire in Jackson Park, during the Columbian exposition, there were often sudden calls for a large amount of water, and the pressure was increased from seventy-five to one hundred and fifty pounds per square inch. There was laid in the exposition grounds at Jackson Park some thirty-five miles of water mains. After the pipe was laid test pressure was applied of 100 pounds per square inch. All the exposition buildings were amply provided with this protection, and to make it effective a pressure of 75 pounds per square inch was carried constantly on the mains. There were 96 fire alarms during the time of the exposition, from May 1 to October 31, 1893, and no fire engine did any service on buildings where the protection existed. As soon as the alarm was struck the water pressure was run up to 100 or 150 pounds; this was a positive order, which was regularly and imperatively carried out. The most severe trial of any pipe in the system was given the 24-inch main supplying the electric fountain. This water was pumped directly into the mains, and the service required that any or all jets were to be thrown on or off instantaneously; the pressure carried was between 80 and 90 pounds, running up to 150 pounds at the pumps on the sudden shut off. The severity of the test can be appreciated by one who comprehends the impact imparted by such a blow through such a non-elastic agent as water. I make this presentation of facts to emphasize more fully the value of good inspection.

EXPERIENCE IN FILTRATION AND AERATION.

By S. A. Charles, Superintendent of Water-Works, Lexington, Ky.

The city of Lexington, Ky., is supplied with water by an impounding reservoir of about 120 acres in area, dependent upon the rainfall and the drainage area of about 3,000 acres for its supply. During the hot months, from June to October, inclusive, our reservoir gradually becomes filled with algae and vegetable matter, at times in hot weather emitting an unpleasant odor. We also occasionally have an influx of mud after a heavy rain, but this last we regard as a trivial matter in comparison with our troubles with algae, and the problem that has confronted us has been not merely the removal of mud, algae and foreign substances, but especially the removal of odors.

Our exeprience leads us to believe that deodorizing cannot be done by filtration alone, and that aeration must be relied on for this purpose.

We believe we have succeeded in this object in a simple, inexpensive way, and after three years' experience we cannot think of any change to be made in the theory or plans on which we have worked except possibly to enlarge and carry the ideas still further.

We use mechanical filters of the type known as the "gravity filter." We adopted this style because it is open to inspection the same as a filter bed, or even more so, and because the rate of filtration like that of a filter bed is dependent on the head of water and the filtering area. It also has the merit of being open, and affording an opportunity for the escape of all gases and odors, and entirely prevents carrying air into the water mains and the formation of air pockets.

The pressure filters (so called) seem to me to be based on faulty theories.

First. The resistance must increase as the film on the surface of the sand thickens, and an ever growing and uncertain pressure must be maintained to force the water through. This means not only decreased efficiency of filtration, but also increased coal bills.

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Second. Pressure tanks are usually of iron, and however dilute the coagulant used may be, yet if alum or sulphate of albumina is used, the result must be to corrode the iron of which the tanks are made.

Third. There is no opportunity for aeration or for any gases or air to escape. Whatever air or gas goes into a pressure filter must appear in the mains in the shape of air pockets, or escape at the faucets where delivered to the customers, sometimes much to the anonyance of the customers' olfactories.

For the above named reasons we have adopted the gravity filters at Lexington, and contend that there is no result which it is possible to attain by the use of filter beds that we cannot attain by their use. There is certainly some number (more or less) of gravity filters which will produce the same result as so many acres (more or less) of filter beds, and if the original number of filters is not sufficient it is an easy matter to add to the number.

The use of a coagulant very much increases the safe rate at which water may be filtered. The film which forms on the surface of the filtering material and which is so effective in thorough filtration forms rapidly when a coagulant is used, and slowly when it is not. There is therefore little or no lost time with a mechanical filter as compared with a filter bed.

Still there are limits which cannot be safely exceeded with any filter whatever, and I am inclined to think that in many cases the same as with filter beds, too much has been expected from too little area, and that manufacturers of mechanical filters and their customers also, from motives of economy have endeavored to get along with too small a filtering surface.

There is no reason that I can see why sand in a filter tank will not do all it will do in a filter bed, and such additional amount as is due to the use of coagulants, and the shorter time lost in cleaning.

But there are some advantages derived from the use of mechanical filters which should be taken into account. Among these are economy of space and also original cost and the substitution of machinery for manual labor. Why should a week be spent in cleaning where a few hours with suitable thorough aeration given to the water and the mode in which we add the coagulant.

We aerate by letting the water fall in a spray of about 1,600 fine jets through a perforated pipe, a distance of about seven feet to the filter below. After passing through the filters it passes through a charcoal vat with a perforated button and again falls in a spray to the clear water basin.

This simple method of aerating has been quite effective and has entirely removed all odors. We have an air compressor in reserve which was originally designed to aerate by blowing sprays of air through the sprays of water, but so far we have had no occasion to use it, the aeration by spraying through the air being sufficient and saving the cost of running the compressor.

The depth of sand in our filters is thirty inches and the annual loss is about six inches. We use white sand (Horn island) which we get from New Orleans at a cost of a little over a dollar a barrel,—making our annual expense for sand about one hundred dollars. The upper six inches of sand seems to do all the work and it is seldom it is strained below that depth. We wash from four to five times in twenty-four hours in hot water, and use water quite freely in so doing, as none of it is lost, but all gets back to the reservoir after a settling and straining process.

We have experimented with sand and crushed quartz of various degrees of fineness but have found little or no difference in the results; the film or coating which rapidly forms on the surface of the sand seeming to do the work about the same in either case.

We have also experimented with settling basins with a view of taking part of the work off the filters, but found it impracticable, for the reason that the algae and vegetable matter with which we have to contend, is so light that it will not settle, but floats or remains in suspension, leaving us no alternative but to let the filters do all the work.

As regards the use of a coagulant I think much of its effectiveness depends upon how it is used and I cannot, I think, do better than quote from my former report:

"We have a little simple device somewhat

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requires much less coagulant; and is positive and certain, irrespective of variations in pressure or speed."

The sulphate of alumina which we use as a coagulant varies in amount from a minimum of one-third of a grain per gallon to a maximum of one grain per gallon, varying with the condition of the water and the season, and will not average more than eight-tenths of a grain per gallon for the entire year. This small amount (small when the character of our water is considered) we attribute to our mode of injecting the coagulant by which we can vary from one grain per gallon to the thousandth of a grain with the utmost accuracy and regularity.

I estimate the cost of filtration and aeration at $6 per million gallons exclusive of interest on the cost of the plant, which was $27,000, but this is for an output of only a million and a half gallons per day. Better results should be obtained where the filtering is done on a large scale, and where cheaper coal can be obtained. I have figured the coal at $2 per ton.

The small output of one and one-half million gallons per day in a city the size of Lexington is accounted for by the fact that 95 per cent. of our taps are metered, and there is therefore no waste. In this connection I may remark that meters and filters properly go together, and should not be separated.

With regard to typhoid fever statistics, to which so much importance seems to be attached lately, we have no reliable data in Lexington, but this much at least we do know—that whatever cases there have been, were attributable to the use of wells and other sources of supply. In thirteen years there has not been one solitary case of typhoid fever, or any other disease which could be traced to the use of reservoir water. Such a charge has never been made against it.

There are some other matters which we think increase the efficiency of our filtration, to which I will briefly call attention:

First—All our filtered water is stored in a clear-water basin and is carefully excluded from the light and from any possible contamination from germs being blown into it. We find in our warm climate that any exposure to air and light results very quickly in what almost seems to be spontaneous generation.

Second—We provide at the lowest points in our mains, openings which we call "washouts" and through which we flush and completely empty the pipes at intervals during the hot weather. By opening and closing the proper valves, and putting on pressure at the pump house we can scour out almost any line at pleasure, refilling, of course, with fresh water. These "washouts" are much more effective than hydrants for flushing purposes, the discharge being directly from the main instead of from a point three or four feet above it.

The results thus far have been quite satisfactory to ourselves and customers. We have had almost no complaint whatever of the quality of the water since the installation of our filter plant, while before that time complaints were frequent.

FREE WATER FOR PRIVATE BATHS.

By L. N. Case, Superintendent of Water-Works, Detroit, Mich.

I am inclined to look at the word "free" rather suspiciously. I am inclined to reason thus: If anything is to be supplied free to "A," at the expense of "B," for, of course, everything that costs money has got to be paid for, I must know, before approving the idea, if the benefit accruing to "B" is commensurate with the burden of the extra expense imposed upon him. As to this proposition to furnish free water for private baths I find that the expenditures for establishing and maintaining a water works are, to a great extent, derived from the people from assessments made on the basis of certain established rates; that almost invariably bath tubs are charged for at an average price of $2 each per annum, and that the income from such source is considered necessary. Therefore, if the charge on bath tubs is abated, the amount formerly received therefrom must be derived from some other source, either by an increased charge on other fixtures or upon the family rate.

In Detroit there are 12,500 bath tubs which are in premises owned by people who are able, if not willing, to pay the small charge therefor, but which must be abated should "free baths" prevail.

The question as to how many of those now unprovided would be induced, by the abatement of the charge for water, to go to the expense of a bath tub, must of course be problematical. I cannot but think, however, that the percentage will be very small, and certainly not more proportionately than the inducement. It must be remembered that the pur-

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chase and proper connections for a tub will amount to $15 or more, and it does not seem reasonable to suppose that many would be influenced to go to this expense by the fact that they would not be obliged to pay $2 per annum for the water used therein.

Now, supposing an appropriation is made to furnish tubs for all premises, utterly ridiculous and impossible as it may seem, there would still be lacking another feature to its success, and that is the obligation to bathe.

The class most desirable to reach from a sanitary standpoint is not particularly fond of water as a lavation. The old saying that you can lead a horse to water but cannot make him drink, is very applicable in this connection.

A friend of mine owns a cottage, next door to one occupied by himself, which is furnished with a bath tub. He says that, of his own knowledge, that no member of the last four families used this tub during their entire occupancy.

This is but an illustration of conditions that I believe generally prevalent among the laboring classes, and is but the result of an habitual neglect from childhood of personal cleanliness, growing out, probably, of their environments and the lack of opportunity or inducement to care for the same.

It would seem necessary, then, in order to make this proposition a success, to not only abate the charge for the water, but also to provide tubs, and in addition to enact an ordinance requiring each individual to bathe at regular stated intervals.

I most emphatically do not wish to be understood as opposing anything that is for the real benefit of the masses, their education or improvement. On the contrary, I am of the opinion that there is far too much neglect among the intelligent and wealthier classes of their less fortunate fellow-men.

There is, in my opinion, a grave responsibility resting upon those endowed with brains and money to take careful thought of the conditions of those less favored, and to direct and control the influences that will tend to improve those conditions.

If we are anxious to do them good, to elevate them mentally or physically, let us devote our energies and means on the lines of practical common sense.

I am aware that this proposition will be sustained by the argument that the expense can be imposed upon the property, on the ground that the possessors thereof will derive a benefit from the improved sanitary conditions. This might be partially true if its establishment should produce the result contemplated; that is, the establishment of bath tubs in the apartments of the working people.

I am satisfied, however, that this would not be the result, because, in the first place, of the expense of the tub and its attachment, and, in the second place, on account of the absence, generally, of the desire to avail themselves of the privilege so provided.

This, to me, is an entirely different question to the establishment of public baths. In the latter case, the tub, the water and all the appurtenances are provided. One thing only is lacking, and that is the inclination, and this would be fostered and often created by the very novelty of the enterprise.

No! gentlemen, in place of trying to "eclipse the free public baths of Europe" by instituting free water for private baths in America, let us rather advocate some great national scheme, by which the laboring classes of this country may obtain sufficient work to enable them to provide, first, food and clothing for the body.

I know it is an old and trite saying that cleanliness is next to godliness, but a full stomach and comfortable raiment are better still, and are, in my opinion, far more conducive to the happiness and health of a people than all the baths in the world.

MECHANICAL FILTRATION.

By W. P. Mason, Professor Department of Chemistry, Rensselaer Polytechnic Institute, Troy, N. Y.

Having been intimately acquainted with unacquainted with the type of mechanical

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deep, together with the washing machinery, occupy the upper portion of the tank, leaving below an empty chamber 6 feet high, through which the raw water must pass on its way toward the sand.

To discover just what this lower chamber would do in the way of relieving the filter proper of a portion of its work, was the reason for instituting the test. It would be proper here to state that the dose of alum had been added to the water before the chamber in question was reached, and also to observe that the water entered the chamber in a tangenital direction, near the circumference of its circular bottom, and flowed away through a pipe in the center of its roof.

Such an arrangement naturally caused the water to take up a movement of rotation, more or less coincident with the surface of a cone whose base was the floor of the chamber and whose apex was the orifice in the center of the roof. Timbers supporting the sand layer above naturally interfered with the uniformity of this motion.

It was not denied that coarse and heavy material, such as sand, would be retained by the chamber, but there were those who held that flocculent aluminum hydrate, with its entangled or "coagulated" material, was much too light to settle to any material extent under the conditions obtained.

As a result of the seven days' trial run, with an average of 10,731 gallons of water passing through each filter per hour, a number of interesting observations were secured, showing that the chambers in question certainly fulfilled a useful function and did relieve the filters to a material degree.

Upon opening the chambers at the end of the seventh day a large quantity of aluminum hydrate was, in every case, found lying upon the floor in forms like drifted snow and varying in depth from almost nothing near the circumference to 14 inches and more toward the center of the bottom. It was impossible to calculate the volume of these drifts, but it was plainly equivalent to many cubic feet.

It was proposed to determine the purification value of this apparently large precipitation by catching it in a filter press and subsequently weighing it, after drying. This was accordingly done with the sediment from one of the tanks, with the result that the large volume of coagulated material made a very indifferent showing when translated into weight. It was, and still is, however, my strong opinion that volume, not weight, is the important factor to be considered when dealing with this precipitate.

It must be admitted that the material forming the sediment banks in the Elmira tanks was very light, but it was heavy enough to fall, or else it would not have been there; and, provided it be heavy enough to fall, it is certainly true that the greater its bulk for a given weight the better will be its efficiency, for it will cover so much the more space while falling, and thereby increase the chances of entangling suspended impurities during its formation and descent.

Rain drops falling through the air carry down impurities, of course; but if transformed into flaky snow, their purifying action is much increased, although their specific gravity is lessened.

It is for these reasons that I think the relative efficiency of the chamber below the sand bed should be measured by the volume of the retained preciptatate rather than by its weight.

The photographs scarcely show one other feature of these aluminum hydrate deposits, which to me was of considerable interest, namely, the numerous ball-like aggregations occurring throughout the mass. It would seem that the hydrate had in many places been rolled together and built up much after the same manner that a boy accomplishes the gradual enlargement of a ball of snow. This formation I believe to have resulted from the rotary motion given the water by the special device for its introduction already alluded to. Motion such as that is, in my opinion, decidedly favorable to the formation of large flocks in a liquid in which aluminum hydrate is already formed. Certainly it is a mistake to suppose, as has been so often maintained, that the most rapid "coagulation" and precipitation of the hydrate is to be secured by permitting the liquid containing it to remain in a state of complete rest. The photographs shown herewith illustrate that gentle rotary motion, far from being objectionable, is a distinct advantage. The two jars here shown differ from each other but in the fact that the left hand one had its contents gently rotated, while the contents of the companion was maintained at complete rest. In each the same quantity of hydrate had previously been formed. The photographs show how progressively advantageous was the rotary motion for the formation and deposit of large flocks of the hydrate; nor is this to be wondered at when one considers that the movement in question furnished opportunity for more frequent collision, with resulting adhesion, of the growing flocks. As already stated, the evidence of such action on the large scale in the Elmira tanks was very pronounced.

With reference to the bacterial efficiency

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of these tanks, it was interesting to observe that an average of 42.6 per cent. of all the germs present in the raw water had been removed by the time the sand was reached.

Finally, a word with regard to the claim so often advanced that a closed pressure filter, operating without a chamber between it and the point of introduction of the alum, does not act as a surface strainer, but that the deeper portions of the sand bed have their parts to play in the work of purification as well as the surface layer.

This claim I found to be perfectly true. By tapping such a filter at points both above and below the sand surface I was enabled to secure samples of water from various depths in the sand body.

Analytical results showed that the alum was not entirely decomposed, and, consequently, the chemical equation not fully satisfied until considerable depths in the sand bed had been reached.

This was to have been expected, in view of the fact that time is an element in all chemical reactions, and a pressure filter, running under the conditions named, allows but small time to elapse after the addition of the alum until the sand is reached.

As a corollary to this proposition, the tanks we have been discussing must also serve as reaction chambers, permitting of complete decomposition of the alum, and such I found them to be upon further investigation.

AN OIL FILTER FOR BOILER FEED WATER.

By Dabney H. Maury, Jr., M. Am. S. M. E.

The main steam pumping plant of the Peoria water company consists of three Worthington compound condensing duplex vertical high duty pumping engines of 7,200,000 gallons daily capacity each, against a pressure of about 135 pounds; with six Heine water tube boilers of 200 H. P. each, or 1,200 H. P. in all; and the necessary boiler feeders, air pumps, jacket pumps, dry well pumps, air compressors, electric light engine and dynamo.

The pumping engines are rated at 100,000,000 ft. lbs. per 1,000 lbs. of steam. Usually but one pumping engine, with the necessary auxiliaries, and two boilers, of a total of 400 H. P. are in use at a time, the time of actual pumping averaging seventeen hours per day.

In May, 1896, the writer made a test of this entire steam pumping plant under ordinary working conditions, with a view to determining the lines on which improvements could be made in its operation. A description of this test was presented as a paper before the Illinois Society of Engineers and Surveyors at its Springfield meeting in 1897. I quote the following from that paper:

"In the light of the information furnished by the tests the changes were made in the feed-water return system. It was considered of first importance to diminish the deposition of scale and oil in the boilers. To accomplish this, the writer decided to use as much condensed steam, and as little fresh feed water as possible; to separate the oil from the condensed steam (which has no scale-forming ingredients, and to remove the carbonates and sulphates from fresh-feed water (which has no oil), treating the two separately before allowing them to mix in the boilers. * * * A trial showed that the emulsion of the oil and the water could not be separated by gravity. Arrangements are now made to remove as much of the oil as possible by filtration. A portion of the oil in the exhaust steam from the auxiliaries is removed by the Austen separator set on the exhaust pipe line from these pumps to the hot well.

"The fresh feed water * * * is forced by the pressure in the mains through a 50 H. P. Hoppes live steam purifier, purchased for the purpose, which removes a considerable portion of the salts of lime and magnesia. The advantage of treating the fresh condensed feed-water separately will be apparent when it is remembered that if all the feed water had to be treated to remove the salts a purifier of 800 H. P. would have been required to do the work now done, and with a margin to spare, by the one of 50 H. P. * * * A small Crown meter measures the fresh feed-water before it goes to the purifier. This little meter plays an important part in the economical operation of the plant, for an excess in its registration during any man's watch means negligence, and each man is encouraged to reduce the meter readings to a minimum. Leaks that formerly went undetected for long periods, owing to the very large number of pipes and valves in the system, are now promptly discovered."

As will be seen from what I have just quoted, which was written in the latter part of 1896, no serious difficulty was anticipated in filtering the oil from the condensed steam. But before satisfactory results were reached we learned that the problem was not so simple after all.

The condensers are of the surface type, and the air pump which returns the condensed steam from them to the hot well was already pumping against almost as great a

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head as it could manage, so that it was not feasible to add enough to its load to enable it to force the water through a pressure filter, so it was decided to employ the gravity type.

Having decided to employ gravity filters it was of course deemed desirable to avoid the use of coagulants.

As the condensed steam was absolutely pure, except for oil, and as a large part of the scale-forming impurities in the very small proportion of fresh water used would be removed by the live steam purifier, some method of removing the oil from the condensed steam was all that was needed to make an almost perfect feed-water, with all the blessings attendant thereon.

The first filter tried was a thirty-inch galvanized iron tank with perforated bottom, which was conveniently set over a reservoir connecting with the hot well. This tank contained about one foot in depth of sponges, held between the meshes of a pair of strong wire gratings. These gratings could be squeezed together or loosened, by a bolt and nut, and the filtration could be made fast or slow as desired. The sponges did not seem to catch much oil, so cotton waste was tried instead, with no better results. After this, straw, hay, excelsior and coarse cloth were tried in turn, and while the rate of filtration required to get all the condensed steam through the small filter area was unquestionably too rapid, the results gave no encouragement, and the oil caught would hardly have sufficied to grease the proverbial gimlet.

For those who may desire to look into the subjects of oil in feed water and of oil filters the following references are suggested: Transactions Am. Soc. Mech. Eng'rs, Vol. XIII, pp. 248 to 258; Vol. XIV, pp. 118 to 146; Vol. XVII, pp. 295 to 315, and Cassier's Magazine, October, 1897, "Marine Feed Water Filtering," by Nisbet Sinclair.

All this time we were taking well-meant advice from our friends, and the prescriptions were as numerous as those described by Mark Twain in his famous chapter on membranous croup, there being one point of resemblance in them all—their failure to afford relief. At last, however, a filter man told us of a certain steam plant in which the boiler fed water, consisting principally of condensed steam, was simply filtered through could give but little information as to the results in either case. The general impression gathered by us, however, was that the rate of filtration was too rapid, and the effluent was not very different in appearance from the raw water. Nevertheless, our next attempt was with coke and sand as filtering media, and for the first time there seemed to be some prospect of success. A couple of old cocoanut-oil tierces were fitted with the necessary inlet pipes, strainers, outlets, valves, etc., and into one was placed about four feet in depth of screened sand, while the other was charged with one foot of powdered coke on top of three feet of sand. The effluent from these crude filters seemed slightly better than the raw water, but the improvement was hardly noticeable. The results seemed to show, however, that a much slower rate of filtration might be successful, so a sand filter consisting of three compartments, each of twice the area of one of these tierces, was designed and ordered built.

About this time the writer, still in search of light on the subject of oil filters, put into the question box at the Denver meeting of this society a request for information as to the best method of removing oil from condensed steam for boiler feeding. My query was not answered, except that after the meeting I was told by an authority on filters that the only way to get rid of the oil was to use a coagulant, putting into the already softened water enough lime to precipitate the alum.

After my return from Denver the new filters were finished and were put in operation Aug. 29, 1897. They have been in service ever since. The accompanying photograph show their construction. No especial claim is made for originality, as the general arrangement of valves and piping is similar in many respects to that commonly seen in mechanical filters, but it seemed to the writer that a complete record of the results of an experiment which was so successful in our case might be of interest to other steam users who are troubled with bad feed water.

A steel tank is divided into three equal compartments, known respectively as filters Nos. 1, 2, and 3. All three filters are generally used at once. When one requires cleaning it can be shut out and cleaned without interrupting the use of the other

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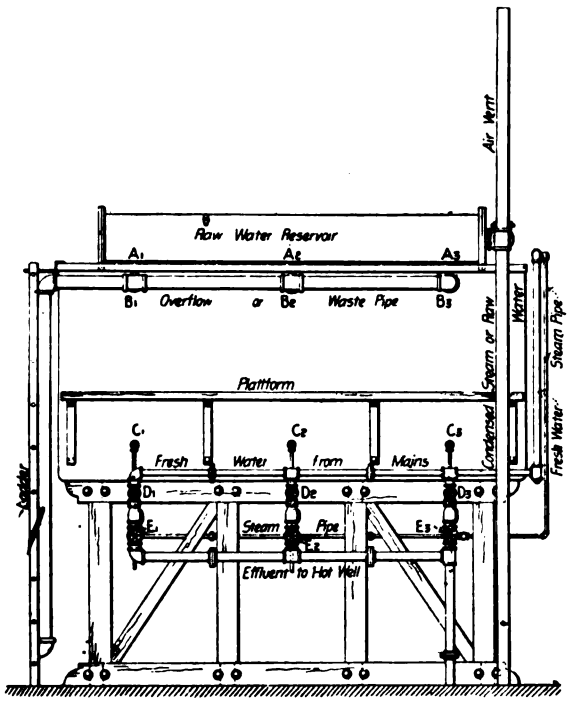
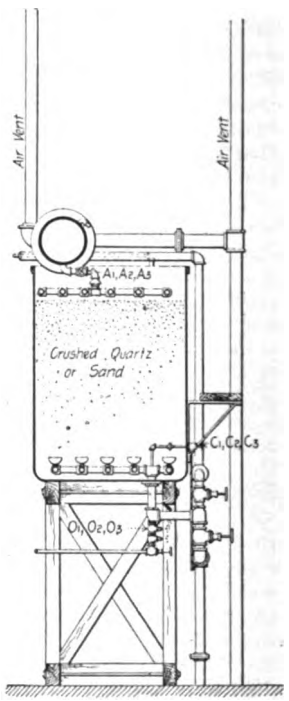
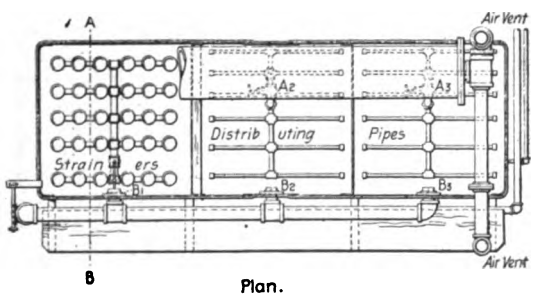
at the right of the tank into the 12-inch cast-iron distributing pipe over the filters. This water is freed from air by the two risers shown. Three 1-inch valves, A1, A2 and A3 admit the raw water through a gridiron of perforated pipes, to the top of the sand. In the bottom of each filter are thirty strainers connected to used to wash the filters, while 01, 02 and 03 are ¾-inch valves on the steam line used when necessary for heating the wash water. Plugs in the 3-inch line at B1, B2 and B3 are employed instead of the more costly and cumbersome valves for opening or closing the overflows or wastes from the filters while washing. The overflow or wash water



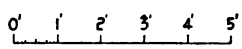
Side Elevation.



Transverse Section A–B.



Plan.



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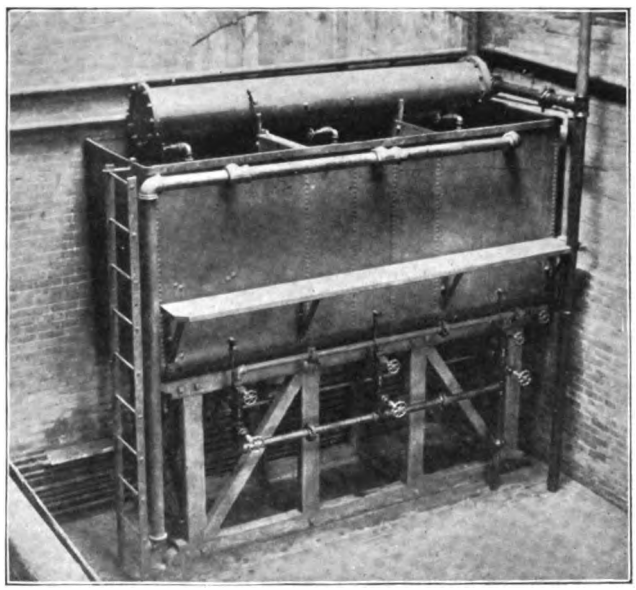
take a sample from Filter No. 1, for instance, the 2-inch outlet valve E1 is closed, and the ¼-inch angle valve C1 is opened and the water flowing from the quarter-inch pipe is caught in a bottle or other suitable vessel. The tank is supported on a framework of oak resting on concrete foundation. A steel ladder gives easy access to the board platform from which the upper parts of the tank can be readily reached.

Before this filter was put into service and during the period in which we were trying to use as much condensed steam as possible instead of fresh water, the oil in our boilers was giving constant and very serious trouble. The lowest row of the tubes in each boiler buckled up from four to seven inches and leaked almost without exception. It was necessary to shut down at least once a week and swage up and frequently to renew the tubes in this row. There was little or no scale in the boiler, but a brown, gummy or viscous coating was found, especially near the bottom of the rear water leg and in the lower tubes. Since August 29, 1897, the record is very different. There has never been a shut down to repair a boiler, and no new tubes have leaked. Boilers are kept under steam constantly day and night from two to

Below follows a detailed statement of the condition under which the filters and the boilers were operated:

1. Period covered, August 29, 1897, to May 31, 1898, 276 days.
2. Actual time pumps and filters were running, 4,695 hours.
3. Approximate total evaporation of feed water by boilers, 38,383,000 lbs.
4. Approximate total fresh water, 3,518,000 lbs.
5. Approximate total condensed steam, 34,865,000 lbs.
6. Percentage of fresh water in total feed water, 9.2 per cent.
7. Percentage of condensed steam in total feed water, 90.8 per cent.
8. Analysis of fresh water.



OIL FILTER FOR BOILER FEED WATER.

Nitrate of potasium.....	.617 grains per gal.
Nitrate of sodium	.294 grains per gal.
Chloride of sodium	2.598 grains per gal.
Sulphate of sodium	2.407 grains per gal.
Sulphate of magnesium..	3.213 grains per gal.
Carbonate of magnesium	.205 grains per gal.
Carbonate of calcium ...	15.917 grains per gal.
Oxides of iron and aluminum	.046 grains per gal.
Silicic acid	.840 grains per gal.
Total	26.137

Water is remarkably clear and contains nothing in mechanical suspension.

9. Hardness of fresh water, 20 degrees by Clarke's scale.

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densers to the filters, except such oil as may have been caught by the condensers.

12. Total cylinder oil fed into auxiliaries, 46 gallons, equal 184 quarts, equal .67 quarts per day.

An unknown proportion of this oil was removed by the Austen separator on exhaust pipe line from auxiliaries to hot well and did not get into the boilers.

13. Average temperature of condensed steam entering the filters from the air pumps, 56 degrees Fahrenheit.

This low temperature is due to the low temperature of the condensing water (50 degrees Fahrenheit) and to the large area of condensing surface. The water generally leaves the filters several degrees warmer than it enters.

14. No. of washings of filters in 275 days:
Filter No. 1, 11 washings.
Filter No. 2, 9 washings.
Filter No. 3, 11 washings.

15. Average number of days each filter ran without washing, 26.7 days.

16. Time consumed in washing as follows:

Water is allowed to run slowly from the city mains with as little steam as necessary for about 1½ hours. The sand is stirred at intervals for a few minutes at a time. The washing is done by the regular fireman on duty at the time.

17. Area of each filter, 12.25 sq. ft.

18. Combined area of all three filters, 36.75 sq. ft.

19 Depth of sand or quartz, 3 ft. 6 inches.

20. Rate of filtration:
In lbs., per hour, 7426.
In gals., per hour, 89.5.
In cubic feet per hour, 11.88.
In gallons per acre, per 24 hours, 2,546,024.
In vertical inches per hour, 3.87.

21. Cost of filter for concrete foundation, oak frame, steel tank, screened sand, crushed quartz and such pipes, valves and fittings as were not in stock, $135; estimated value of material used from stock, $55; total, $190.

N. B.—The most of the pipe-fitting was done by the regular pumping station crew; all other labor is included in the first item of $135.

22. Repairs to boilers since filters have been in service, none.

23. Repairs to filters, none.

24. Annual saving in boiler compound, $175.

25. Estimated annual saving in coal, due to absence of oil and scale, 10 per cent. of coal bill, $400.00.

N. B.—There is also a large annual saving in repairs to boiler and in boiler cleaning, but the actual amount of this is difficult to estimate.

Observations of the working of the filter show that at first, after cleaning, the filtration is not as thorough as after the filter has been running a few hours. This is doubtless due partly to the fact that the sand is loosened up by the washing and requires time to settle again and close the voids, and partly to the fact that the film of oil formed over the top of the sand after the filter has been running a short while materially aids the filtration. It was difficult to tell whether the sand or the quartz was the more efficient filtering medium, but it is believed that the best results under equal rates of filtration were obtainend from the quartz. In every instance, however, it was noted that slower filtration increased the efficiency of the filter. Before making this filter the writer made inquiry of several prominent filter men and was informed that no patents would be infringed by its construction, and if this account of our experience should lead to the use of some similar device by any fellow-sufferer from the evils of bad boiler feed-water, the writer will feel amply rewarded for the time and labor spent in the preparation of this paper.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

REPAIR OF ASPHALT PAVEMENTS.

We have a little over a mile of Trinidad sheet asphalt pavement in this city, which has been laid seven years. Does any one make a small outfit for making repairs? We need only a few yards at a time. Do other cities make their own repairs? We must pay a contractor $3 a yard for making repairs.

F. E. C., Amsterdam, N. Y.

The advertising pages of MUNICIPAL ENGINEERING give the names of makers of machinery for mixing asphalt for pavements. Probably the smallest plant possible for good work was used in laying your pavement, and it would be necessary for you to purchase a plant of nearly the same size for your repairs. It takes experts to run the plant also. The plant will deteriorate rapidly and require frequent repairs. Clearly it will be less expensive to have your pavements repaired by the contractor at $3 a yard than to do it yourselves. You will also get better work. No city has yet run a re-

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pair plant of its own long enough to demonstrate its success. Only large cities with enough repairing to keep a plant reasonably busy can afford the luxury of owning their own plants. It is possible that such cities would find them economical, but this has not yet been fully demonstrated.

MIXING ASPHALT FOR PAVEMENTS.

Kindly give the names of firms that manufacture portable asphalt plants.

Is there any book published treating on mixing of asphalt for pavements?

J. Bristow, Narragansett Pier, R. I.

In the advertising pages of this magazine will be found descriptions and pictures of the portable asphalt paving plants, manufactured by the principal makers of such apparatus.

No book is published giving the details of methods of mixing asphalt for pavements. The later books on pavements and the ordinary specifications give the ingredients and their proportions within limits, but describe processes only in the most general way, or do not describe them. Differences in materials make such differences in mixtures that experienced men are required to produce the best results. The art can not be learned from books. The pages of MUNICIPAL ENGINEERING contain more information on the subject than can be obtained elsewhere in printed form.

THE BEST SIZE OF PAVING BRICK.

Which give the best results for brick paved streets, paving blocks, as they are called, say 4x4x9, or brick, size of common building brick, say 2x4x8?

O. C. Breed, Fulton, N. Y.

The size of blocks within the limits mentioned does not make so much difference as the character of material, method of preparation, particularly mixture and burning, and method of laying. Brick manufacturers seem to prefer the smaller sizes, perhaps because it is more difficult to burn the larger sizes thoroughly and uniformly, and there is likely to be more waste in the kiln. Such imperfect or poorly burned blocks can not be disposed of so readily for other purposes, so that the blocks may cost a little more per square yard than the bricks. Theoretically, with homogeneous material, uniformly burned, the larger blocks would produce a pavement which would remain smooth longer, and this is practicably attainable. Too wide a block is objectionable on account of difficulty in burning, and on account of less satisfactory foothold for horses. The difficulties in burning increase very rapidly after the thickness becomes more than 2½ to 3 inches. The writer's experience with blocks 3x4x9, and with bricks of the same manufacture, 2x4x8, laid under the same specifications, is in favor of the larger size. The same is true in case of all good blocks with which he has had experience.

AN INEXPENSIVE CEMENT TESTING MACHINE.

Could you suggest a design for an inexpensive cement testing machine, such as any mechanic could construct?

C. V. Kerch, Dixon, Ill.

A simple testing machine can be made of a wooden lever about ten feet long, supported by a steel pin on two uprights, set 20 inches from one end. On the top of the lever is laid a track of light T iron, on which a wheel supporting a weight runs. The pin holes in the lever and its supports are reinforced by iron washers. The lever can be graduated in feet and inches. The dimensions of the lever depend on the stresses required to be generated. Clips for holding bri-

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quettes are fastened near the short end of the lever and directly opposite on the base. The accuracy of the results obtained depends upon the care with which the machine is constructed and experience with its use. The machine can also be used for shearing and for measuring compressive strains. It is very inexpensive. A more elaborate and accurate machine can be constructed for ten or fifteen dollars. Accurate results depend so much upon the proper apparatus for preparing test pieces and for holding them in the machine, that the comparatively small additional sum necessary to purchase a standard machine is well invested, repaying itself in the added confidence felt in the results.

DEPRECIATION OF A WATER PLANT.

Can you refer me to any articles or pamphlets on the depreciation of a water plant? I would like to know what amount or percentage should be fairly charged for depreciation on each of the following items: Pumps, boilers, buildings and mains. *O. M. L., Wilkes-Barre, Pa.*

The rate of deterioration of the various items mentioned depends so largely upon the character of the first construction, and upon the local conditions and care taken of the machinery, that there has been no systematic attempt to deduce an average depreciation for the separate items. The life of water pipe is estimated at twenty to sixty years, with an average of about thirty years, some engineers, however, claiming that no good water system in this country is old enough to have reached the limit of the life of first-class cast-iron pipe. A general idea of the annual depreciation of the plant, as a whole, can be derived from a study of the maintenance, renewal and repair accounts if they are kept in sufficient details. Mr. E. Kuichling discusses this subject in his report to the Executive Board of Rochester, N. Y., an abstract from which is printed in MUNICIPAL ENGINEERING for October, 1897. On page 211 of that number, he concludes that an annual payment of two per cent. of the cost will produce a fund sufficient to renew the works or to pay off the original cost in 30 years, the assumed life of the works. On page 150 of MUNICIPAL ENGINEERING for September, 1897, is a brief notice of a report by the City Engineer of Los Angeles, California, of the present value of the plant and the amount of deterioration in it (practically a gravity plant). Detailed figures are not given in the report, nor the average age of the plant. The indications are, that the observed deterioration is not far from one per cent. a year, but this takes no account of the annual payments for renewals, there being no reports of such expenditures made by the company. The character of material used and the local conditions are such that there is little question that the actual total deterioration equals or exceeds two per cent. a year.

The city engineer of Omaha, in a report on the water-works made in 1896, assumed one per cent. a year as the average deterioration in excess of the annual expenditure for removals and repairs, there being the same lack of detailed reports of such expenditures. A discussion of the relative economy of steel and iron pipe, made by an engineer on the Brooklyn water-works, gives details of experiments tending to strengthen the basis for assuming a total annual deterioration of two per cent. so far as pipe is concerned. This paper, by I. M. De Varona, is printed in the proceedings of the American Water-Works Association for 1894. When the

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works at Haverhill, Mass., were purchased by the city in 1893, the total annual deterioration was estimated to average two per cent. Mr. F. C. Coffin estimates the life of water pipe at 35 to 40 years. A fund produced by annual payments of 1.5 per cent. of the cost, placed at interest at three per cent., would produce this cost in thirty-seven years. In a system requiring pumps, deterioration of other portions of the works, and even of pipe, is more rapid, so that this figure must be increased to the two per cent. named by Mr. Kuichling. If water-works accounts were kept in sufficient detail this subject could be studied with more ease, and more definite results could be obtained. If any of our readers have reports of actual observations we shall be glad to publish them.

BOOKS ON COMPUTATION OF CUBIC YARDS.

Would you advise me where I can get a ready reckoner, or book of some kind for computing cubic yards, perches and other measurements? *A. S., Lancaster, Pa.*

Among books of this kind are Haswells' "Engineer's Pocket Book," $4; Trautwine's "Engineer's Pocket Book," $5; Molesworth's "Engineer's Pocket Book," $2; Hurst's "Engineer's Tables," pagee 1½ by 2½ inches, 40 cents; in case, 50 cents. These are probably arranged in about the order of their value to the inquirer. MUNICIPAL ENGINEERING Co. can supply them.

INFORMATION ABOUT DISPOSAL OF GARBAGE.

We want information regarding disposal of garbage. To what can you refer us that will help us in our study?
H. H. Pratt, Brookfield, Mo.

A number of articles on various parts of the subject have appeared in MUNICIPAL ENGINEERING. Among them are the following: 1895, p. 301, June; p. 103, Aug.; p. 225, Oct. 1896, p. 56, Jan.; pp. 199, 201, Mar.; p. 94, Aug.; p. 167, Sept.; p. 377, Dec. 1897, p. 378, June; p. 295, Nov.; p. 348, Dec. 1898, p. 44, Jan.; p. 367, June. The supplement to the June number of *Municipal Affairs*, reviewed in another column, is a valuable report of actual experience; price, 50 cents. Among books treating in part of this subject are "The Cleaning and Sewerage of Cities," by E. Baumeister, $2.50. "Sanitary Engineering," by H. P. Brunois, $6; "The Disposal of Household Wastes," by W. P. Gerhard, 50 cents. MUNICIPAL ENGINEERING Co. can supply any of them.

RELATIVE MERITS OF BRICK AND CEMENT SIDEWALKS.

I would like your opinion as to the relative merits of brick and cement sidewalks. Can you give me the names of firms who make paving brick for sidewalks?
A. H. M., Goodland, Ind.

In regard to cost, a good brick sidewalk can be laid for say one-third to one half the cost of a good cement walk. Though the cement walk is practically indestructible, on the ordinary residence street or even business street in a small town, a brick pavement can be renewed as often as necessary on the interest of the excess in cost of the cement walk. As to color, the brick walk is more satisfactory to most persons. With a light rain, the bricks absorb the moisture, while on the cement walk a slight film of water forms, making it more likely to wet the dresses and thin shoes of ladies. On the other hand, well-laid cement walk is in place for an indefinite period. If not too white it forms a pleasing contrast to grass, trees and pavement; if laid with sufficient slope pools of water do not form on it; there is no unequal settlement, nor are

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there loose bricks to make the walk uneven or perhaps dangerous. A cement walk is perhaps more frequently slippery in winter, but the surface is uniform, so that falls are not so frequent. Some consider the effect of cement walks upon trees to be injurious. Careful observation leads to the conclusion that the injury, when there is any, is done by careless treatment of the roots of trees in preparing the ground for the pavement, and that the subsequent effect of the pavement upon the trees is inappreciable.

As to makers of sidewalk brick, the advertising pages of MUNICIPAL ENGINEERING give the names of many makers of street-paving brick, many of whom make special forms of such brick for sidewalks. Every kiln of first-class building brick has a certain proportion of bricks which are burned hard enough to answer for ordinary brick pavements at less cost than the shale bricks and with the saving of freight in most cases. Walks with large foot traffic should have the harder brick.

CITY APPOINTEES EXEMPT FROM CIVIL SERVICE RULES.

The state law explicitly says: "The heads of departments shall be exempt from the operation of this (the civil service) law." The fire, water and street departments are in charge of a board who appointed a street superintendent to take charge of the street department. The local civil service commission claimed that the appointment must be made from an eligible list prepared by them after an examination, while the appointing board claims his exemption from examination as the head of a department. Can you give us some light on the question?

W. F. F., Rochester, N. Y.

The details of the administration of most of our American cities have been determined upon in a manner so entirely without coherent plan, as custom and the immediate requirements of each case seemed to demand, that in most instances it is difficult to define what is meant by a department. In one sense of the word the board having charge of the three departments mentioned are the heads of these departments (or this department), and so are, strictly speaking, the only persons in them (or it) who are exempt from the supervision of the civil service commission so far as appointment to office is concerned. That this is not the accepted definition of "head of department" is evident from the fact that the civil service commission exempts from examination certain employes of the board who have duties of such importance and of such nature that they may be considered as heads of departments. Some of them would not be so considered, however, in such cities as have properly coordinated the various departments of city service and definitely and logically fixed their boundaries and the duties of their heads.

So long as there is no competent legal definition of the terms "department" and "head of department," it should be perfectly proper for the civil service commission to carry out the provision in its rules stating that any new office will be considered as belonging to the class requiring examinations unless otherwise decided by the commission itself. In the absence of exact definition, there must be some body or officer whose function it is to make the decision in case of each office, and the law seems, by implication at least, to delegate this power to the civil service commission. If it were otherwise, evasion of the civil service law would be comparatively easy, new departments being created as rapidly as necessary. This mode of evading the law has been declared illegal in Illinois, and may be the same in

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other states having statutes concerning municipal civil service. If the civil service commission is arrogating too much power to itself, the matter can be brought to a prompt decision in the courts by a refusal to follow its requirements, a refusal to pay the salary of the appointed officer and a suit to collect it. The duties of the street superintendent are not defined in the question and it is impossible to say whether he is the head of a department or the head of a subdepartment, or even the head of a section of a sub-department.

The general principle upon which the city work should be divided into departments and the departments definitly defined, is developed in the charters of St. Louis and Greater New York with fairly close adherence to a logical plan. In the city of Rochester lines of work which have little connection are grouped under a single board or department, in some cases, while in others, work which belongs to a single department is distributed among several departments, boards, or commissions. The definition of department in that city is, therefore, more than ordinarily artificial, and there is special need of an authority to interpret the definition in each special case.

BY WAY OF COMMENT.

Ethics in Engineering. At its last meeting for the season the Engineers' Club, of St. Louis, considered the subject of engineering ethics, and the discussion was of interest as much for the indications of what was not in the minds of the speakers as for the points actually considered. The paper of the evening considered the subject in the line of the general definition of ethics as "the science which treats of the nature and grounds of moral obligation and of the rules which ought to determine conduct in accordance with this obligation," but others who discussed the subject confined themselves to the more restricted definition, wishing to consider or to deny the desirability of "a particular system of principles and rules concerning moral obligations and regard for the rights of others, whether true or false." Underneath the expressed thought of nearly all was apparent the fear that a fixed code of ethics would be based on a false system. To one speaker the question of schedules of fees seemed to be the most important branch of the question; to another, determination of the qualifications of practitioners; another wished to bear strong testimony to the fact that the standard of personal honesty was higher in the engineering profession than in any other walk of life; another wanted a specific code to discuss; and another acknowledged the lack of instruction of engineering students in ethics, but would apparently restrict such instruction to talks on honesty, uprightness of purpose, morality in general. The subject is evidently one of many sides, of which each speaker had heretofore seen but the one which appealed

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most directly to him. A point in the paper on which particular emphasis was placed was just this lack of knowledge of the subject among engineers, the lack of professional esprit and the consequent lack of coherence in the engineering profession, which is still further affected by the modern necessity for specialization. Frequent and free discussion of the various phases of the subject of ethics would tend to unify the profession by giving its members common ground of interest and discussion and a rallying point from which a view of the relations of the profession to the business world, and the necessity of closer organization can be obtained. The necessity of a broader education as a foundation for professional work as a corrective for the narrowing tendency of the excessive specialization now called for was also emphasized. The discussion demonstrated the fact that the subject is one upon which the engineers of St. Louis have expended very little thought and that full consideration of it would be of great benefit whether it led to definite action of any sort or not.

Denver and New Orleans Water-Works.

The water company of Denver, Colo., has offered the works to the city at a price which is reported to be approximately $9,000,000. This is a case in which it would probably not be equitable to apply the method of valuation based on the earning capacity of the works, unless the water rates are higher than in other cities in the same proportion that the cost is higher. Neither would it be satisfactory to base the purchase price on the original cost, with allowance for deterioration, unless ample allowance is made for constructions, which have been abandoned or found to be inadequate. On account of the natural conditions the supply of water to the city is somewhat more expensive than the average, so that possibly a proper figure for the works would be one based on careful estimates of the cost, at the present time, of constructing the existing working plant and the cost of constructing a new plant fully adequate for the needs of the city. The works have been manipulated in the past in much the same manner as the works at Omaha, in part by the same persons, and with similar results, so that the amount of stock and bonds oustanding bears little relation to the actual cost of the works, and still less to their real value. Nine million dollars is a large figure for waterworks for a city the size of Denver, even with the extra first cost there necessary, and careful examination by engineering and financial experts should be made before the city pledges itself to pay that sum.

The public press of New Orleans is also agitating municipal ownership. The water-works are inadequate for the supply of a city one-fourth the size, and the quality is poor, as the supply is taken from the Mississippi river without prop-

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er treatment, and where it is subject to pollution from the refuse of miles of docks and levee with their shipping. The works are said to pay a reasonable interest on $2,000,000. If the city is unable to secure the works at a valuation approximating the actual value of the plant, and can secure them at something like this figure, it will be true economy to purchase the works, even though it will be necessary at once to establish a new pumping station, purchase new machinery, and rapidly extend the pipe system. The latest reason for demanding an adequate and healthful supply is the report that New Orleans was abandoned as one of the points for concentration of troops on account of the unsatisfactory water supply. This, if true, cuts off from the city a revenue which would go far, during the time it lasts, towards paying the interest on the cost of an adequate plant. New Orleans and San Francisco are now the only cities of 250,000 or more which do not own their water-works.

Licensing Architects and Engineers. Illinois is the first state, says *The Technograph*, to enact a law requiring every practicing architect to obtain a license from a board of examiners. That journal, a semi-official organ of the University of Illinois, is of opinion that the law will be of great benefit to the public, as it protects citizens from injury or loss by incompetent architects, and to the profession, especially the younger members, because it insures that practicing architects shall have scientific knowledge and technical training. The law tends to raise the average of technical attainments in the profession rapidly. The state of Illinois assumes the regulation of many trades, such as plumbers and even horse-shoers, and of professions, such as medicine and architecture, but has not yet touched the profession of engineering. So far, the legislature has refused to license surveyors. As the need for engineers increases, and the necessity for high technical attainments is better recognized, the people will take up the regulation of engineering as it has the others, unless engineers themselves take up the matter and guide the course of events. The state has a right to regulate the practice of engineering, so far as it relates to public work, and in some states this is done, not by licensing engineers, but by requiring them to submit their plans for public work to a competent board, such as the state board of health, for sewerage and water supply. This process does not cover all lines of public work; for example, the regular work of a city engineer, but so far as it goes is a good step in advance. Others will follow until the people consider themselves protected against their own ignorance and unconcern. If engineers wish the matter to be disposed of in a manner entirely satisfactory to themselves they must take the first steps and carefully guide the legislative hand.

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Street Cleaning.

Municipal Affairs, the quarterly publication of the New York Reform Club Committee on Municipal Administration, issues a large supplement with its June number, giving a report upon the methods and results of street cleaning and garbage disposal in the city during the years 1895, '96 and '97, being the report to the mayor by the commissioner in charge of the department.

A report of his observations in European cities is made by George E. Waring, Jr., and the remainder of the book is taken by the reports of his subordinates in the work in the city of New York. Two-thirds of the book gives a general view of the methods of garbage disposal in use in European cities, and considerable detail of the methods in use in New York during the period covered by the report, with full estimates of the cost of various steps, and the salvage resulting from several operations upon the city's refuse, including use of swill, preparation of fertilizers, waste paper traffic, treatment of ashes, etc. This portion will be a valuable handbook upon the subject. While most of the work described is done under peculiar conditions in New York City there are many details which would be valuable in other large cities and in many smaller municipalities.

One article gives an interesting

sumed at 100. The cost of cleaning pavements of other materials in good condition; pavements in good, fair and bad condition; with light, medium, heavy and dense traffic; with various kinds of rails for street cars; with elevated roads; privately sprinkled; with various classes of population, is estimated. On account of the practical impossibility of separating these various items in practice to determine their effect upon the cost by actual observation, the relative effects of these various conditions were estimated by the eleven district superintendents and the average of their estimates was assumed as the measure of the relative difficulties of cleaning streets. These estimates give the actual results in practice. If, for example, granite and Belgian block pavements were kept as clean as asphalt the relative cost for asphalt, granite and Belgian would be 100, 200, 220 instead of 100, 150, 160 actually used for the actual conditions of cleaning. The averages are:

For kind of pavement:

- Asphalt 100.
- Granite 150.
- Belgian 160.
- Brick 100.
- Wood (Smooth Karri) 100.
- Cobble 400.

For condition of pavement:

- Good 100.
- Fair 120.
- Bad 140.

For amount of traffic (number of

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Heavy 100 to 150, 180.
Dense 150 to 300.

For kind of rail for street cars.
None 100.
Flat 110.
Grooved 110.
T rail 120.
Steam 140.

For condition of pavement between tracks:
Good 100.
Fair 110.
Bad 120.

For sanding:
Little 110.
Much 120.
For heavy sprinkling 125.
For elevated railroad 110.

For character of population:
Good 100.
Fair 200.
Bad 300.
For blocks with schools 100.
For blocks with produce markets 125.
For blocks with push-cart trade 175.
For blocks adjoining unpaved streets 200.

The accuracy of this table was checked by comparison with the number of sweepers actually employed in each subdivision in the city, and proper amounts of work were assigned to each in accordance with the observed conditions and the computed comparative difficulty resulting. Thus one sweeper can keep clean 20,000 square yards of asphalt in good condition. The number of sweepers necessary to keep a street clean under any combination of the above conditions could be obtained by multiplying 1 sweeper by the percentages of increase in the table for those conditions, adding the products to unity and multiplying the sum by the number of square yards in the street, divided by 20,000. For the entire city, 1,623 sweepers were employed, each sweeper keeping clean an average of 5,746 square yards, at an average cost of $2.40 per 1,000 square yards a week; indicating, according to the estimate above, that asphalt in good condition could be kept clean at 69 cents per 1,000 square yards a week. The cost for any of the given conditions can be approximated by multiplying 69 cents by the percentages of increase given for those conditions, and adding them all thereto, if rates of pay, rentals, etc., are assumed to be the same as in New York City. These figures do not include any of the cost of carting away the sweepings, nor any of the other expenses of the department, being simply the cost of cleaning the street. The resulting cost of cleaning corresponds fairly well with averages in other cities.

A very interesting report on snow removal and on the labor question in its relation thereto is also given.

Pay of Engineers. Our own country is not the only one in which just complaint can be made of the estimation in which engineers' services are held. The East Elloe Rural District council, in England, is advertising for a surveyor to devote the whole of his time to the supervision and repair of 115 miles of road, furnish his own horse and a bond for 100 pounds, for 62 pounds 10 shillings a year—about $310. It is estimated that the keeping of the horse and the fee for the

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bond will take half of this, leaving the surveyor less than $3 a week for his share. Many of our American engineers are justly complaining of the low prices of work of a similar grade, but few of them are reduced to such starvation wages as this. Doubtless it is an exceptional case, in England, but the Association of Municipal Engineers is laboring with a good will to improve the condition of practitioners in this line. Our own state engineers' societies will do well to follow its lead.

City Ownership of Water-Works at Kingston, Ont.

The city of Kingston, Ontario, purchased its water-works in 1888, and issued bonds for $120,000, apparently nearly the cost of the works. Since that time $192,600 additional bonds have been issued to pay for additional improvements, and $33,500 of bonds have been retired. There are now nearly three times as many miles of pipe, two and one-half times as many services, over three times as many water takers, and over five times as many hydrants, as in 1887, and the consumption is over twice as great, being 1,288,788 gallons a day in 1897. This amount of water is pumped in less time and with less expense for fuel than half the amount was pumped in 1887. Water rates were reduced 20 per cent. in 1888. of bonds each year, the ordinary expenses of running, and have had a surplus of $3,500 to $7,000 each year. The hydrant rental is now practically the same ($1,620 a year), for 217 hydrants as it was in 1887 for 42 hydrants, the city being charged with this cost of service. The expenditures for new work have steadily decreased from $82,000 in 1888 to $3,300 in 1897. By the reductions in rates from $26.83 average per taker, in 1887, to $9.58 in 1897, by the steps above mentioned the revenues have been kept nearly constant, being only $5,400 (less than 25 per cent.), more in 1897 than in 1887. The careful supervision of expenditure has aided in making this possible. Total ordinary expenditures were increased only 50 per cent., though the amount of water pumped was doubled and the length of the system was increased from 10 miles to 27.75 miles. Most of this increase is due to the interest and sinking fund payments, the increase in actual working expenses being only $600 in ten years.

This appears, from the figures given in detail in the report, to be a remarkable instance of the possibilities of economy under municipal ownership. Public ownership has evidently popularized the use of water and efficient management has at the same time permit-

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at a nearly constant figure. This is evidence that municipal ownership, even of a small system, may be most economical for the public, when properly managed. The principle of requiring a certain amount to be paid by the city at large, here in the shape of hydrant rental, is adhered to. Until 1897 the amount required from the city was gradually increased, but not in proportion to the increase in number of hydrants, but in that year a material reduction in the charge to the city was made. In 1887 the city paid the company $37.50 a hydrant. In 1896 the charge to the city was $11.40 a hydrant, and in 1897 it was reduced to $7.45. These reductions are even greater than those to consumers, quoted above.

The comparative economy the last year of company management and the first year of city management is shown by the fact that the city ran the pumps eight hours a day longer, pumped 317,000 gallons a day more for $1,800 less cost for working expenses. The interest account was also reduced somewhat, indicating that the city could obtain money on more favorable terms than the company. The cost of fuel was also reduced, notwithstanding longer hours. The same economy in management extends throughout the period covered by the statements.

INFORMATION ABOUT MEN.

LOWRIE.—The Denver board of public works has appointed Mr. H. C. Lowrie city engineer, to succeed Mr. Donald W. Campbell. Much work is about to be done in extending the sewer system of Denver, and as Mr. Lowrie made the original plans for the system and had charge of the early work, his services were regarded as specially desirable in supervising the extensions. He has a reputation as an exceptionally capable engineer, and has a record as one of the best that ever served the city of Denver, where he lived for twenty-five years. The appointment, as shown by the comments of the Denver newspapers, is a very popular one. Mr. Lowrie was born in Lancaster, O., in 1851. He lived in Ft. Wayne, Ind., during his early manhood, but on account of ill-health went to Denver in 1873. He was first elected city engineer of Denver in 1875, and served till 1878. He was reappointed in 1879, and after an interval of a year, when he was chief engineer of the Denver & New Orleans railroad, was again re-elected as city engineer, holding the position until 1889. Now, after nine years, he is again in his old position, with much important work before him for immedite attention. He has done much engineering work besides the services performed for Denver. He made the sewer plans for Colorado Springs, Salt Lake City, El Pasco, Tex., and Jackson, Tenn., and was for a time employed as a consulting engineer on the sewerage work in New Orleans. He has also done much work for railroads in the West.

WARING.—The new administration in New York City, for reasons best known to itself, undertook to suppress the official report from the street cleaning department prepared by and under the direction of the commissioner, Col. Geo. E. Waring. The report was prepared with much care and was in type when the new administration came into power and refused to issue it. When these facts became known the Committee on Municipal Administration of the New York Reform club decided that no more practical work could be accomplished than to issue this report as a supplement to the June number of Municipal Affairs. This has been done, and thus a valuable city document has been preserved and put into permanent form.

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The first chapter of this report, which by the way comprises nearly 250 octavo pages, is devoted to "Street Cleaning In Europe," being the result of a careful and thorough investigation made by Col. Waring in the summer of 1896. In the other chapters the work of the department is explained in detail. Every process is fully described, from the sweeping of the streets to the disposition of refuse off Sandy Hook or to the sale of bottles, rags, etc. A chapter on the "Adjustment of Labor Questions" is of particular interest in showing how disputes are promptly and satisfactorily settled by the department without strikes, boycotts or other labor troubles.

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GREENE.—Since the last issue of Municipal Engineering Col. F. V. Greene has been promoted, by appointment of the president, to a brigadier-general, and has sailed for the Philippine Islands in charge of the second expedition of troops. It has been confidently expected that his splendid executive abilities and his thorough military training would rapidly carry him to the front rank in the service. When the call for troops was issued Col. Greene quickly got his regiment, the Seventy-first New York, in readiness for service, having arranged to relinquish the management of the affairs of the Barber Asphalt Paving company, of which he is president, to Mr. A. L. Barber, and his regiment was the first to go to the front from New York. He was in camp with his regiment near Tampa when his promotion was announced, and immediately afterward he was ordered by the war department to report to Gen. Merritt at San Francisco for duty in the Philippines. The parting with his regiment was affecting, as his men were very fond of him. Gen. Greene belongs to a military family, his father and brothers having been officers in the army. He is a son of Gen. Geo. S. Greene, the oldest living graduate of West Point Military Academy, now a resident of Morristown, N. J. He was born in Providence, R. I., in 1850. He was a pupil in Trinity school in New York at the outbreak of the war, but obtained permission to accompany his father to the front, and was with him in the army of the Potomac for four years. In 1864 he was sent to Burlington college in New Jersey, and two years later, on the appointment of Gen. Grant, was admitted to West Point Academy. The next four years was passed in the practical work of surveying and marking the international boundary along the forty-ninth parallel. This gave the then Lieut. Greene much practical experience in difficult engineering, for which he has often proved himself fitted. Then followed a brief assignment to a confidential position under the secretary of war. His literary tastes were cultivated by much reading and many writings which he began to produce at that time. He was selected in 1877, with the approval of Gen. Sherman, and sent to Russia as military attache, where he arrived on July 18, to accompany the Russian army, with a view to report upon its operations during the Russo-Turkish war. He passed the remaining nine months of the war

BRIG.-GEN. F. V. GREENE.

with that army and was present at the battles of Shipka, Plevna, Taskossen, Sophia and Philippolis. When the Russian army arrived, Feb. 3, 1878, in front of Constantinople, Lieut. Greene, during the armistice, rode alone through the Turkish lines into Constantinople, a very hazardous undertaking, considering the prejudice, ignorance and fanaticism of the Turkish soldiers and citizens, who with great difficulty were persuaded that he was other than a Russian officer. Notwithstanding his comparative youth at that time, his military bearing, bravery, character and worth were recognized by the emperor of Russia and the king of Roumania, from whom he received decorations. His report to Gen.

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Sherman, published under the title of "The Russian Army and Its Campaign in Turkey, 1877-78," was so well received that Lieut. Greene was at once recognized both as a clear, concise writer and as the best military critic in the United States at that time. The next phase of his life was that of municipal engineering, which began in 1879, when he was assigned to duty as assistant engineer commissioner of the District of Columbia, including, of course, Washington City. He was promoted to the rank of captain in 1883. He next became instructor of military engineering at West Point, where he served until 1886. He decided to leave the army and devote his time to civil pursuits. His experience in the work pertaining to roadways and pavements, and a careful study of them in the principal cities of Europe and America, led to a connection with the Barber Asphalt Paving company, of which he became vice-president, and a year or two later, when Mr. Barber wished to relinquish his duties as the chief executive of the company, Col. Greene became president. He has since continued in this position, and has rendered valuable service in the upbuilding of the vast business of the company. He has found time for much writing and is a frequent contributor to the leading magazines. As colonel of the Seventy-first New York regiment in the National Guard he kept in touch with military affairs, and through this connection is now brought to the front in the military field. The public may expect to hear much of him in the Philippines.

WALKER.—A great deal of brick paving and sewer construction is about to be undertaken at Independence, Kas., and Mr. Jno. M. Walker has been elected city engineer to take charge of the work. Mr. Walker has had twenty years of varied engineering experience in the West. He received his engineering education at the State University of Kansas. In 1879 he began active work, first as rodman, then as instrument man, on what is now the S. K. division of the Santa Fe railroad. He was subsequently placed in charge of the first division. From this road he was transferred to the Memphis system, then under the same management as the Southern Kansas, where he continued until that line was finished to Memphis. He was then appointed chief engineer of the Belleville & Centralia (now the Air Line), running from Belleville, Ill., to Mt. Vernon, Ill., wnich line he located and partly constructed, but work was suspended until the Air Line built the road. In 1885 he began water works construction as an engineer for Messrs. Comegys & Lewis, New York, constructing works at Belleville and Shelbyville, Ill.; Crawfordsville, Shelbyville and Warsaw, Ind.; Chillicothe, Mo.; Nebraska City, Neb; Lawrence, Kan., and constructed a reservoir for them at Bryn Mawr, Pa. Under the management of Coffin & Stanton he reconstructed works at Ft. Madison, Ia; Paoli, Kan.; Abeline and Topeka, Kan. He was superintendent of works at Lawrence for four years. He made plans for works at Chanute, Kan., and in 1896 made plans and built works at Coffeyville, Kan., where he acted as superintendent of water works and city engineer until this spring, when the election brought in a new set of officers. He planned and built 35,000 feet of sewers for Coffeyville and made plans for water works at Shawnee, O. T. He is now preparing specifications for brick paving and a complete sewer system for Independence, Kan.

BOEH.—The Cincinnati Board of City Affairs has appointed Mr. William H. Boeh superintendent of the reorganized water works department of that city. The position is one of importance, as the superintendent will have large responsibilities. Mr. Boeh is a native of Cincinnati. He was born there fifty-one years ago. He entered the office of Mr. Joseph Earnshaw, a well-known civil engineer, in 1863, and remained with him almost continuously until 1878. During the last few years of his connection with him Mr. Boeh became his partner, the name of the firm being Earnshaw & Boeh. In 1878 he was elected assistant engineer, in charge of sewers in Cincinnati. After occupying this position for about six months he was offered an apointment as assistant engineer on the New York, Chicago & St. Louis railway. Before its completion he became principal assistant engineer of the Michigan & Ohio railway, now the Cincinnati, Jackson & Mackinaw railway, being employed continuous until in 1884, he was again appointed assistant engineer, in charge of sewers, in Cincinnati. and toward the close of the year he was elected chief engineer of the city water works, which place he resigned in 1886 to take the place of assistant engineer in charge of repairing the city with granite and asphalt. In 1887 he was offered and accepted a position as assistant engineer of the Duluth, South Shore & Atlantic railway. He resigned this position to take the position of assistant engineer in charge of sewers and highways in Cincinnati. This he resigned in 1893 to engage in asphalt paving, becoming associated with the Trinidad Paving company, with which he continued until his election on June 1, 1898, to his present position.

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CURRENT INFORMATION.

Municipalities Cannot Change Water Rates Fixed by Contract.

An important opinion was rendered by Judge Welborn in the United States district court, in the suit brought by the Los Angeles water company against the city of Los Angeles. The action was brought to have the city ordinance passed in 1897, fixing water rates for the year beginning July, 1897, declared invalid on the ground that it was in conflict with the terms of the contract entered into in 1867 by the city of Los Angeles on the one side and the assignors of the Los Angeles City Water company on the other side.

Under the contract of July 22, 1868, the city of Los Angeles leased its water works to John S. Griffin, P. Beandry and Solomon Lazarus, assignors of the Los Angeles City Water company, for a term of thirty years, to distribute water and receive the profits, and the city reserved the right to regulate water rates as follows:

"Always provided that the mayor and common council of said city shall have and do reserve the right to regulate the water rates, charged by said parties of the second part, or their assigns, provided that they shall not so reduce such water rates or so fix the price thereof to be less than those now charged by the parties of the second part for water."

On April 19, 1870, the common council accepted and the mayor approved a report of the commissioners, appointed by them, establishing water rates and charges for domestic purposes in accordance with those fixed in July, 1868. In June, 1871, the city council, on a report of a committee constituted similarly to the first one mentioned, established the same rates as those fixed in April, 1870. On August 13, 1874, a committee constituted in the same manner, reported that it had established water rates and charges for domestic purposes, taking as a guide as near as possible the charges and rates for domestic and other reasonable objects and purposes charged in July, 1868. This report was adopted, and a committee appointed in conjunction with the city attorney to draft an ordinance embodying the rates fixed in the report. On August 20, 1874, an ordinance so drawn was adopted by the council and the rates established by said ordinance were the same as those established in 1870 and 1871. Since, and including the year 1880, the city council has, in February of each year, passed an ordinance fixing the rates to be charged by all corporations and persons within said city supplying water to the inhabitants thereof, to be in force one year from and including July 1, which rates have been less than the rates charged in 1870, and the Los Angeles City Water company has collected the rates thus fixed by the city, and no more. In 1896 the council passed an ordinance fixing the rates to be charged for water for the year commencing July 1, 1896, and ending June 30, 1897, at less than they had ever been before. Suit was brought to set aside the ordinance, and in Februrary, 1897, the city passed the ordinance, making a still further reduction in the rates. The action of the Los Angeles City Water company in collecting the rates fixed by the several ordinances constitutes the only acquiescence (if it be acquiescence) in the action of the council. If the rates established in 1870 were collected for the year beginning July 1, 1897, and ending June 30, 1898, the revenues received by the Los Angeles City Water company from said rates would be more than $50,000 in excess of the amount which would be received under the rates named in the ordinance of Februrary, 1897. A statement was furinshed to the council in January, 1882, by the water company of its transactions for the preceding year, protesting at the same time against the establishment of any rates less than those which were in force at the date of the lease, July 22, 1868. In January, 1883, the company again furnished the council with a statement showing the names of the consumers of water, the rates paid during the year preceding the date of the statement, and also an itemized statement of the expenditures made for supplying water during the year preceding, but expressly denying any legal right on the part of the council to demand said statement or to fix any rates less than those which were in force in July, 1868, was filed. Similar statements, accompanied by similar protests, were made annually thereafter up to and including the year 1889, and since that time unverified statements or reports, showing its receipts and expenditures, have been made by the company to the council each year.

Judge Welborn's conclusions are that the contract of July 22, 1868, in so far as it provides that the city shall not reduce water rates below those charged at that date, is valid, and therefore that the ordinance of 1897, which was passed pursuant to constitutional and legislative requirements of the state of California does fix water rates below the minimum so prescribed, thereby impairing the obligations of said contract, and should be annulled.

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Tariff on Asphalt.

A claim was made in a recent case by importers of asphalt mastic that under the act of 1897 it is dutiable at 20 per cent. ad valorem under sec. 6 and others, 50 cents per ton under paragraph 93, while duty was assessed at $3 per ton under paragraph 293. The board of general appraisers decides that the pertinent provisions of paragraph 93 are: "Limestone rock asphalt containing not more than 15 per centum of bitumen, 50 cents per ton; asphaltum and bitumen, not specially provided for in this act, crude, if not dried, or otherwise advanced in any manner, $1.50 per ton; if dried, or otherwise advanced in any manner, $3 per ton." We find as follows from the evidence: "1. That the merchandise is something more than rock asphalt, as it is rock asphalt combined with other bitumen or asphaltum. 2. That it is commercially known as asphalt, or more particularly as asphalt mastic. 3. That it is an asphalt not specially provided for. 4. That it has been advanced in value and condition by a process of manufacture. In view of these findings it would appear unnecessary to consider the report of the United States chemist that the merchandise contained more than 15 per cent. of bitumen. In accordance with our findings the assessment of duty at $3 per ton under paragraph 93 is affirmed."

Convention of Mayors and Councilmen.

The second convention of the League of American Municipalities will be held in Detroit during the first week of August. The local committee of arrangements in Detroit, of which Mayor Maybury is chairman and J. A. Robison is secretary, is endeavoring to bring a large number of visitors to the city in connection with the meeting, and it is expected that there will be many in attendance, especially from cities and towns within easy reach of Detroit, who do not belong to the League, a low rate of fare having been secured for the occasion. The Detroit committee is interested in making as great a success as possible of the meeting, and is proceeding independently of the business end of the organization in New York. The program for the meeting does not provide for special papers, but contemplates general discussion, on the subjects of garbage disposal, civil service boards, commissions or council committees, regulation of saloons, street paving, remuneration to cities for franchise rights, municipal ownership of public services, and public water supplies. Addresses of welcome will be delivered by Governor Pingree and Mayor Maybury, and there will be a response by the president, John MacVicar, mayor of Des Moines.

A Very Severe Test of Asphalt.

The Rockford, Ill., Register-Gazette reports that recently a Chicago, Milwaukee & St. Paul freight train crossed South Main-st. on the new asphalt pavement. The report says: "Instead of tearing up the top coating and gouging two ugly ditches across that thoroughfare the wheels of the cars left little more than a dim trace of their passage across the Trinidad. While the first news of the mishap caused consternation to the street department and the city offices in the Brown building, it is considered as the most conclusive test to which the new paving has yet been subjected. The train that made the plunge across the street was a string of gravel cars. The train was a long one, composed of nearly 50 cars, and was in the hands of the switching crew. Spectators expected to see the pavement a ruin. Only the faintest mark, however, was noticeable. The engineer reversed and pulled the cars back across the street and up onto the track without even so much as missing a wheel. Edward Main, the superintendent of streets, in speaking of the accident, said: "I could hardly find the place when I went down to look for it."

The Law on Street Paving in North Dakota.

The supreme court at Bismarck, N. D., handed down a decision reversing the decision of Judge Pollock in the paving case from Fargo, N. D., and holding that the law authorizing paving is constitutional and that all the expense of paving a city street shall be assessed against the abutting property in proportion to frontage.

Oyster Beds Destroyed by Sewage.

The supreme court has rendered a decision in the suit of Huffmire et al. vs. City of Brooklyn. The plaintiffs were two oystermen of Flatbush, N. Y., who received a permit in 1882 from the town of Jamaica allowing them to plant and grow oysters in a certain creek. In 1889 the authorities of the neighboring town of Flatbush were authorized by the state legislature to construct a sewerage system discharging into tide water. When the system was built its outfall was located about 300 feet from the plaintiffs' oyster beds. The sewage contained a gas-house refuse, sludge acid and other poisonous substances, which were deposited on the bed to such an extent as to

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ruin the oysters planted in 1892 and remaining ungathered in 1893. Suit was brought against the city of Brooklyn, with which Flatbush was incorporated, in 1894. A decision in favor of the plaintiffs was rendered.

Furnace Slag as a Road Material.

A recent test in England of blast furnace slag as a road-making material places it somewhat below the best granite, but above limestone, flint and all other stone tested.

Agreed Prices on Cement Sidewalks.

The manufacturers and builders of artificial stone sidewalks in Grand Rapids, Mich., about twenty in number, have signed articles by which they agree to lay no cement walks under regulation prices, and by which those prices are fixed at 75 cents per square yard for American cement and 80 cents for German cement walks. The seven cement dealers in the city are responsible for having forced the sidewalk men to adopt this advanced schedule of prices, and they will sell no cement to a contractor who cuts these rates. The dealers say that the contractors have been laying walks for from 58 to 65 cents a square yard, which prices are bound to make the contractor lose; hence, the dealers are the ones who suffer at the end of the year when settlements are made.

An Illegal Attempt to Establish a Municipal Electric Lighting Plant.

The supreme court at Bismarck, N. D., rendered a decision in the municipal lighting case of Grand Forks, N. D. The suit arose over the letting of contracts for the equipment of a municipal electric light plant in which several citizens asked for an order prohibiting the payment of money under the contracts, the principal ground being that the execution of the contracts would illegally increase the debt of the city and that there was no legal appropriation made therefor. The petition was denied by Judge Fisk, but the supreme court reversed the decision. The building is completed and most of the machinery is in the city. It is thought, however, that the plant will be completed and run as a private enterprise for a time.

long, leading from the gas works to the river, became stopped up and all efforts to open it by steam, sounding or flushing were fruitless. As the sewer is from 10 to 15 ft. under ground, the idea of digging down to it was not relished. This remedy had about been decided upon, however, as the only one, when the yard foreman, Tom Maguire, hit upon the plan of trying rats in the work. Accordingly traps were set that night, and the next morning Maguire had three large rats, which he introduced into the mouth of the sewer, closing it with a wire screen. Other rats were put to work from day to day. There was no result for about four days, and then a small stream of slime and ooze appeared at the mouth of the sewer. The next day a fair stream of water was going through, and in two days it was cleared.

Legality of Assessments Per Front Foot for Pavements.

The supreme court of Wisconsin recently handed down a decision in the case of Hennessy vs. Douglas county, regarding front foot assessments. The city charter of Superior provides that "the opening, grading, paving or improvements of any street shall be chargeable to the lots or parcels of land benefited thereby in proportion to the benefits secured thereto." The board of public works is required, before any work is done, to view the premises and determine the damages and benefits accruing to each lot by the proposed change. A report on the work is placed on file for public inspection and a notice printed in the official paper that at a fixed date the board will hold a public hearing on the subject. All objections to the plan which are made at the hearing are reduced to writing, and the report—corrected or modified, if it is considered necessary—is sent to the city clerk. The city clerk notifies the city council at its next meeting of its receipt, and if that body takes no action on it, the report is considered confirmed. After the report is modified by the council or confirmed in the manner mentioned, a notice is published to that effect in the official paper, and any property-owner who may consider himself

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assessed at $1,355.03. It happened, however, that the assessment per lot divided by its frontage gave the same sum, $3.45 per foot, except in the case of the single block, which was $4.67. The plaintiffs claimed that the assessments were illegal, because based on the frontage system held invalid in a previous case. The case referred to for precedents was one in which the evidence of the engineer showed that the general method of making assessments was to take the whole number of feet frontage on the street, divide the cost by the number of feet and assess it at so much per foot. Although there was no report of the board asserting that the assessment was acording to the benefits accruing to each lot, the court held that under the laws of Wisconsin such an assesment did not comply with the statutes, although not necessarily erroneous. In the case of Hennessy vs. Douglas county, however, the court ruled that in the report of the board it was stated that the assessment was made according to the benefits secured to each lot or parcel; in determining what lots abutting on or adjacent to the street were benefited and the amount of such benefits in each instance, the board acted judicially, and after an actual view of the premises; consequently its judgment on the question could not be reviewed by the court, unless it acted upon an erroneous principle. The fact that the board, in its report, gave the frontage of the lots upon the street, or that it assessed upon each lot the exact cost of the improvement in front of it, did not itself vitiate the assessment. Nevertheless, a report that the board had assessed the expense of the improvement according to the front foot, without finding and stating that the special benefits were in that proportion, would not be in compliance with the law. The decision shows that the front foot assessment is legal under such charter provisions, provided it is distinctly stated the benefits to abutting property are in proportion to its frontage, whereas, failure to make such a statement will invalidate an otherwise proper assessment.

A Plan for Acquiring Municipal Ownership of Water Works.

A proposition for the purchase of the water plant by the Indianapolis Water company by the city of Indianapolis, Ind., has been suggested by William B. Hord of New York. Mr. Hord proposes the purchase of the water works by a cash payment of not to exceed $200,000, and the balance to be paid by installments out of the earnings of the water works and to be in no sense a liability or obligation of the city. This would involve an agreement on the part of the city to pay about $40,000 per annum additional rental for fire hydrants for a period not to exceed 25 years. The city nows pays $78,000 per annum, and under this plan it would be required to pay an annual hydrant rental of about $120,000. It is calculated that this would give the owners $3,000,000 for the plant. The purchase on the plan proposed will require the city to issue more bonds. These bonds may be sold, it is believed, on a 3½ per cent. basis. The annual payments of $120,000 could be made after this year, it is represented, because next the reappraisement of real estate will add approximately $15,000,000 to the city tax duplicate, which will increase the tax receipts nearly $90,000. Besides this the city still has a margin of 30 cents on the $100 in its tax levy, and an increase of 10 cents—increasing the levy for city purposes to 70 cents—would produce $75,000 additional, which, it is pointed out, would provide for the increasing expenses of the city and would carry the water plant. The board of public works has asked Mr. Hord for a specific proposal for the purchase of the water plant along the lines indicated in his letter to Mayor Taggart, and has asked for a fixed price and terms.

Contracts Must Be Advertised.

The Brooklyn League has made an attack upon Sewer Commissioner James Kane, Brooklyn, N. Y., taking for its basis the practice of giving out city contracts without advertising. The league charges that work has been performed by the sewer department at an exorbitant price. An order was granted by Justice Maddox, of the supreme court, directing Commissioner Kane to appear before him to be examined regarding the sewer contracts let out by him.

Decision Against a Water Board for Maintaining a Dam.

Judge Tarbox of the new eighteenth judicial district, St. Paul, Minn., has filed a decision in the case of Anton Newzell against the St. Paul water board. This is one of over fifty suits brought about one year ago by the farmers of Centerville asking for damages and an injunction against the St. Paul water board for building and maintaining a flume or dam at the outlet of Baldwin lake, in Centerville. They claimed that by means of the dam their lands had been overflowed for a series of years and damaged, and that the water board had never acquired the right to build or maintain the flume, and

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asked for damages of $60,000. The Wenzell case, which was considered a test case, was tried in February, 1898, and the decision just filed grants a perpetual injunction against the maintenance of the dam and allows the plaintiff $1,900 damages for the injuries done to his lands prior to November, 1896, when the action was begun. This amount of damages is at the rate of about $10 an acre and on the same basis the total amount of damages in all the suits would be about $17,000.

The German Way of Thawing Out Frozen Water in Pipes.

A method of thawing out frozen water pipes consists, according to the Deutsche Hausbesitzer Zeitung, in shoveling away the snow from above the pipes, covering them one-quarter meter high with unslaked lime and pouring on water. In consequence of the heat generated thereby the ground and the pipes are thawed out.

Railroads Required to Maintain Bridges Over Their Tracks.

Judge Lewis, of the district court, St. Paul, Minn., issued two alternative writs of mandamus, June 15, to compel railroad companies to repair and maintain bridges over their tracks. The matter has been under consideration for some time and the application for the writs were made by the corporation attorney under a resolution of the city council. The railroads assert that they are not liable for the repairs to the bridges over their tracks.

Contracts Must Be Completed Within Specified Time.

In a decision handed down by the Kansas City court of appeals the special tax bills issued for macadamizing Fourteenth-st., from Virginia to Woodland, were declared void because the contractor did not complete the work of paving within the time specified in the contract. This is the second time that this court has decided that if a contractor did not finish his work in the specified time the special tax bills issued against abutting property to pay for it were void.

"The Disgraceful Condition of the Roadway" Caused a Death.

A teamster fell from a coal wagon at

American Association for Testing Materials.

A meeting of the American section of the International Association for Testing Materials was held at the Engineers' Club of Philadelphia, Thursday evening, June 16, 1898. Mr. Gus C. Henning, as member of the International Council, called the meeting to order, and after briefly stating the object of the meeting, gave a resume of the work of the International Convention held at Stockholm, August 23, 24 and 25, 1897, and also of the council appointed by this convention. The American section was then formally organized with the election of the following officers.

President—Prof. Mansfield Merriman, Lehigh University, Bethlehem, Pa.

Vice-President—Prof. Henry M. Howe, Columbia college, New York.

Secretary—Richard L. Humphrey, in charge of the testing laboratory of Philadelphia.

Treasurer—Paul Krenzpointner, testing department, Pennsylvania railroad, Altoona, Pa.

Confidential Advisers—Prof. Henry M. Howe, Columbia college, New York; Dr. R. G. G. Moldenke, consulting engineer, Pittsburg.

The work of the International Association and of the American section, in particular, was discussed, and also the work of the various international committees. It was decided to hold the next meeting of the American section during the latter part of August, the time and place to be determined by the officers of the section. At this meeting the section will adopt a set of by-laws and will select members to represent the section on the various international committees to which have been assigned the work of studying the numerous problems submitted at the Stockholm meeting, and who will report at the next convention to be held at Paris in 1900.

Proposed New Paving Brick Specifications in Detroit.

The common council of Detroit, Mich., has under consideration the paving specifications recommended by the board of public works

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cracks and other defects and of uniform size, and of a quality to be approved by the board of public works and equal to the approved samples in its office."

The committee on streets recommends that all of the sections after the words "uniform size" be stricken out and the following words take its place: "as per samples in the office of the board of public works." Regarding the kind of brick bid upon the specifications read:

"Each bidder shall state in his bid the kind of brick that his proposition is based upon, which must be of such kind as has been approved by the board of public works, and the brick to be used upon the street under such contract shall be equal in every respect to the approved sample in the office of the board."

The committee's amendment recommends that after the words "of such kind" be struck out and the following substituted:

"As herein specified, and the brick to be used upon the street under such contract shall be equal in every respect to the samples in the office of the board of public works."

The object of the changes is said to be to take from the board of public works the power to decide what kind of brick may be used on the streets. The specifications, as drawn by the board, provide that the board shall have power to inspect and throw out unsuitable brick. While the committee does not strike that out, it practically nullifies it by inserting a clause requiring contractors to give a surety bond to keep brick and asphalt pavements in good repair for ten years and cedar block for five years. With such a guarantee, it is understood, the contractor could order the board's inspectors off the street, or, if he permitted them to inspect, the bond would be worthless. The committee has added to the cedar block specifications "vulcanized paving cement" as a filler.

New Publications.

The Technograph, No. 12, 1897-8, is the latest issue of the annual of the Engineering Societies of the University of Illinois. It contains a number of papers of interest to practicing engineers. One by Professor Talbot on "Standard Methods of Testing Brick" is considered in detail in another column. A new study of the effect of freezing mortar is given which corroborates former results that Portland cement mortars are not externally injured while natural cement mortars are to an appreciable extent. The strength of Portland cement mortars seems to be slightly reduced, but the natural cement mortars are materially increased in strength. There is an apparent misstatement to the effect that Portland cement mortars were never increased in strength by freezing, while the table gives several results in which frozen mortars have strength exceeding 100 per cent. of the standard. Another paper gives the results of tests of 6-inch cubes of concrete of various mixtures which will be of value to engineers in designing concrete structures for various purposes. Papers are also given on specification writing, corrosion of iron, repairs of masonry and by giving it a cement jacket, showing strength of rivet steel, a report of actual tests by Prof. Talbot and others. Published at University of Illinois, Champaign, Ill. 50 cents.

The annual publication of the Engineering Society of the University of Michigan, The Technic, contains many interesting and valuable contributions, among which are the following: "A Wyoming Irrigation System," by C. T. Johnson; "Law Hints for Engineers," Geo. W. Lilly; "Levelling Connections With the Detroit Water Works," C. W. Hubbell; "Strength of Wrought Iron Pipe at Low and High Temperatures," R. C. Carpenter; "The Ethical Status of the Engineering Profession," Charles Carroll Brown. Price 50 cents.

The twenty-fifth annual report of the Lowell (Mass.) Water Board for 1897, states that the water supply of Lowell is obtained from driven wells. The city had the usual experience of bad taste and odor from such water when stored in open reservoirs during the hot season, and decided to overcome the difficulty by storing it in a standpipe 40 ft. in diameter and 60 ft. high, the estimated cost of which is $13,300. Nearly 600 water meters have been introduced, as a result of which the consumption of water is nearly half a million gallons less than in 1896, although at the same rate of increase as occurred between 1894 and 1895 the consumption would be a million gallons per day larger. City Engineer Bowers recommends, in addition to the standpipe, that a new covered reservoir, with a capacity of one day's supply, be built.

Personal.

William Bryant has been elected street superintendent at Mattoon, Ill.

F. R. Smith has been appointed commissioner of highways at Bronxville, N. Y.

J. H. Tedders has been appointed superintendent of public works at Covington, Ky.

Wencel L. Cukierski has been appointed superintendent of parks at Grand Rapids, Mich.

W. A. Johnston has been appointed water commissioner for three years at Cincinnati.

David F. Snyder has been reappointed assistant engineer at Springfield, O., both at increased salaries in recognition of efficient service.

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William A. Sweet has been elected commissioner of highways at North Providence, R. I.

H. O. Harney has been elected assistant engineer of Paducah, Ky., to have charge of the sewers.

Edwin A. Miller has been appointed chief engineer of the department of parks for the borough of Richmond, New York City.

George C. Diehl has been elected county engineer of Erie county, New York, to supervise the construction of improved roads.

John Graves, who has served for fifteen years as a park commissioner at Buffalo, N. Y., has been appointed superintendent of parks.

A. Hamlin has been elected superintendent of sewers at San Diego, Cal., to serve during the absence of Superintendent I. M. Shaw during the war.

Col. Henry T. Douglas, M. Am. Soc. C. E., formerly city commissioner of Baltimore, Md., has been appointed brigadier-general in the volunteer army.

Howard Buckley has been appointed clerk of the water board, Baltimore, Md., to succeed W. E. Thomson, recently appointed clerk in the tax office.

Street commissioners have been elected as follows: L. L. Lindsey, Lincoln, Neb.; A. G. Southey, Bridgeport, Conn.; Chris. Meismer, Connersville, Ind.

George Giess has been elected temporary city engineer at Allentown, Pa., during the absence of J. Howard Martz, city engineer, in the service of the government.

John Graham has been appointed chief engineer, Edward Bernier assistant engineer, and ex-City Engineer H. C. Thompson street commissioner at Sault Ste. Marie, Mich.

Earle B. Lovell has resigned his position as instructor in civil engineering at Cornell University to accept that of adjunct professor of civil engineering in Columbia university.

F. M. Price has been appointed temporary assistant engineer in the street and water department at Wilmington, Ill., during A. J. Taylor's absence in the government's service.

Charles Barker has been appointed water works inspector at South Bend, Ind. John Graham has resigned his positioin as superintendent of the board of water works trustees.

Superintendents of water works have been elected as follows: Hugh Doran, Port Huron, Mich.; Gladding W. Van Slyke, Mendota, Ill.; A. Bell, Athens, O.; Martin Noble, Fitzgerald, Ga.; Chas. S. Currier, Barre, Vt.; Melbourne S. Rogers, South Bend, Ind.; A. G. Scott, Cambridge, O.; B. H. Grove, Lebanon, Ind.; Richard Kuhn, Connersville, Ind.

Gen. Caleb H. Booth, Dubuque, Ia., died June 19, aged 82 years. Gen. Booth was Dubuque's first mayor, and for many years surveyor-general of the Northwest territory.

Albert Rabbe has been appointed city civil engineer at Bellevue, Ky., to serve during the absence of City Engineer Eugene Shinkle in the military service of the government.

M. A. Rafferty, assistant at the Long Island refinery of the Barber Asphalt Paving company, has been promoted to the captaincy of company F, Seventy-first U. S. volunteers, located at Tampa, Fla.

Edwin U. Curtis, ex-mayor of Boston, Mass., has been appointed a member of the Metropolitan park commission. Mr. Curtis was formerly a member of this commission, but resigned the position last year.

Col. William M. Black, corps of engineers, U. S. A. M. Am. Soc. C. E., and engineer commissioner of the District of Columbia, has been relieved of that position and assigned to the staff of Maj.-Gen. Wade.

Albert Steinfeld, Col. Eps Randolph, George Pusch, C. F. Schumacher, B. M. Jacobs and F. E. Russell have been elected members of the board of water commissioners at Tucson, Ariz. Mayor Bushman is president of the board.

Avery D. Andrews, general counsel of the Barber Asphalt Paving company, New York City, has been promoted to chief quartermaster of the Fifth army corps, U. S. volunteers, with rank of lieutenant-colonel, and is now located at Chickamauga.

Prof. Olin H. Landreth, of Union college, Schenectady, N. Y., has been engaged to examine and report on a system of sewage disposal for Saranac Run, Franklin county, N. Y. He has prepared plans for and recommended disposal by irrigation.

City engineers have been elected recently as follows: George C. Dunham, New Britain, Conn.; John L. Cooper, Ligonier, Ind.; Norris H. Brown, Newark, O.; W. A. Gage, Knoxville, Tenn.; James C. Shriver, Cumberland, Md.; Karl Hanson, Connersville, Ind.; John Seibert, Peoria, Ill.

Mr. G. R. Sturtevant was recently elected city engineer of Merrill, Wis., which has a population of 10,000, at a salary of forty cents per hour when actually employed. He did not qualify, but expresses a preference "to work at common laborer's wages of a dollar a day instead of disgracing the profession."

MACHINERY AND TRADE.

Dumping Wagons For Garbage and Other Uses.

A little pamphlet issued by William Beckert, 340 Ohio-st., Allegheny, Pa., explains some of the advantages of the Eclipse dumping wagon for garbage and other hauling. wagons are made for either one or two horses and of any weight or capacity. The body is made of steel plate and will outwear two or three wood bodies. It has an automatic end gate device, and has a lever arrangement at the front end of the body by

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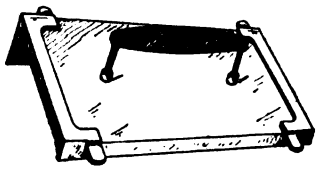
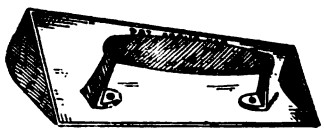
Tools For Making Combined Curb and Gutter.

The Ideal Tool Co., of Indianapolis, Ind., which has been very successful in making useful tools for cement workers, has invented two new tools, which have been patented, for making the form of curb and gut-



ter known as the Parkhurst. Illustrations given herewith show the two tools. The first is for making the top of the curb, and the second is for the angle in the gutter. The two together enable a cement worker to make the best form of combined curb and



gutter. The tools are made in three different sizes, 4, 6 and 8 inches wide. The 6-in. tool is generally preferred. The tools save much time over the methods hitherto followed. Information and prices can be obtained by addressing the Ideal Tool Co., Indianapolis, Ind.

Intermittent Flush Tanks.

A pamphlet on intermittent flush tanks has been issued by the Pacific Flush Tank Co., of Chicago. It gives illustrations and descriptions of the various styles of the Miller & Rhoads-Williams automatic siphons with specifications for the construction of flush tanks, price-lists, a table of rates of discharge and testimonials showing the widespread use of the apparatus and the unusual satisfaction they have given. These testimonials are extracts taken from reports as to the working of the appliances manufactured and sold by the Pacific Flush Tank Co., and are published by permission, one only from each state being used. The pamphlet contains also an open letter to engineers worthy the consideration of all having in charge the designing or maintenance of a sewer system. Copies of the pamphlet can be obtained by addressing the Pacific Flush Tank Co., 84 LaSalle-st., Chicago.

which doors open and close automatically.

605,029—May 31, 1898.—Dumping Cart.—J. W. Taylor, Hernden, Va. A dumping cart particularly adapted for landing garbage and similar substances.

605,153—June 7, 1898.—Suspension Bridge.—J. A. L. Waddell & I. G. Hedrick, Kansas City, Mo. The towers of this bridge are pivoted on their piers so as to swing or tilt length wise of the bridge. Both the upper and lower ends of the towers are then connected by cables, which are connected by suspenders which hold them in inverted curves as to each other.

605,385—June 7, 1898.—Street Sweeper—Alvin Brown, Aurora, Ill. In this machine there is a brush-carrying belt which delivers the dirt into a suitable receptacle.

605,415—June 7, 1898.—Street Sweeper—William Franz, Allegheny, Pa., assignor to Improved Street Sweeper company, Pittsburg, Pa. A sweeper having the usual rotary brush which throws the dirt into the path of a conveyor, which, in turn, carries it to a dirt receptacle carried by the main or rear axle.

605,474—June 14, 1898.—Bridge Construction—J. A. Davidson, Milsap, Tex. Each truss is composed of double series of parts, the parts being secured together between plates and the opposite trusses secured together by brace-rods which are adjustable in length.

605,488—June 14, 1898.—Cableway System and Apparatus for Excavating and Conveying—J. H. Lancaster, New York, N. Y. The dirt is excavated and partially elevated by means of grapples from which it is dropped into cars moving upon an upwardly and outwardly inclined track. The device, as a whole, may be moved along the line of excavation.

Trade Notes.

The Alcatraz Asphalt company will establish a plant in Louisville, Ky.

The Portland cement works at Salt Lake City, Utah, have been destroyed by fire.

The Utica Paving company, Utica, N. Y., will build an asphalt plant in Buffalo, N. Y.

The Ohio Vitrified Pipe Works, Lisbon, O., have, according to press reports, closed down for an indefinite time.

The Ayres Asphalt Paving company, of Zanesville, O., will erect an asphalt plant in Minneapolis, Minn.

The Chickasaw Asphalt company has changed the place of its pricipal office from Ft. Worth to Galveston, Tex.

The Alcatraz company, San Francisco, Cal., contemplates opening up the asphalt mines at La Patera, according to press reports.

The Austin Portland Cement company, Austin, Tex., has been incorporated by E. D. Stolley, A. T. Rose and S. Silverman; capital, $50,000.

The Western Paving and Supply company will erect a permanent asphalt plant in Evansville, Ind., where it has a contract for paving three streets with asphalt.

The McManus Contracting company has been incorporated to build sewers by M. McManus and L. P. Ridenauer of Philadel-

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The machinery and kilns of the Gem Paving company, Quincy, Ill., were considerably damaged recently by the large pond supplying the plant with water overflowing and rushing down on the plant.

The National Building and Supply company, Baltimore, Md., secured large contracts recently for furnishing Portland cement for the new fortifications at Bolivar Point; Ft. Point at Galveston, Tex.; North Point, near Baltimore; Ft. Philip, near New Orleans, La.

The Pridiam Sewage Utility company, Jersey City, N. J., has been incorporated for the treatment and disposition of sewage, by Samuel Pridham, Paul Buchanan and L. F. Mergott of Jersey City, and John Whitehead of Morristown.

A. B. Gould contemplates the manufacture of paving brick on his farm at the south end of Stone island, near Bay City, Mich. A vein of clay 20 feet thick, suited to that purpose, has been located 15 feet below the surface.

The Genral Contracting company has been organized in Indianapolis, Ind., to engage in the construction of sewers, streets, etc., in Indiana, Kentucky and Texas. John M. Lilly is president and Royal Robinson secretary of the company.

George Brandenburg of Chicago has assumed control of the Excelsior Clay company's large plant at Brazil, Ind., and will manufacture paving and hollow brick and other clay products. Extensive additions will be made to the place.

The Assyrian Asphalt company, of Chicago, recently brought suit in the United States court in Columbus, O., against the American Asphalt company, of Columbus, to recover $2,500 and interest since February, 1896, on a promissory note.

The O. S. Kelly company, of Springfield, O., presented the lowest bid for a steam road roller at Wausau, Wis., and the Gates Iron Works, of Chicago, was the lowest bidder for a stone crusher. The committee has recommended that the purchases be made of these companies, but no decision has yet been reached, owing to a proposition made by the Wisconsin Quartz company to furnish crushed rock or lease its plant at prices which the common council estimates would be less than to operate a crushing plant.

The Winona Bridge company, Winona, Minn., held its annual meeting June 16 and elected officers as follows: President, M. G. Norton; vice-president, J. A. Jordan; treasurer, H. W. Lamberton; secretary, H. W. Weiss of Chicago; assistant secretary, Thomas Simpson; superintendent, D. Cunningham of La Crosse.

Hetherington & Berner, Indianapolis, have recently shipped portable asphalt plants to the Warren-Scharf Asphalt Paving Company, New York, and F. E. Cole, Toledo. They are also now erecting a stationary plant for the R. F. Conway Co., Chicago, and have sold a stationary plant to the Assyrian Asphalt Co., of Chicago.

The circuit court at New Philadelphia, O., has affirmed the decision of the lower court in the suit of the Wrought Iron Bridge company of Canton, O., against W. B. Clough & Co., iron pipe founders, of Neomerstown, involving $16,000 for structural work. The decision disallowed claims for damages for alleged delay in supplying the work.

The Western Bermudez company, of Detroit, Mich., has been reorganized under the name of the American Contracting company, limited, for the purpose of enlarging the scope of its business. With the exception of E. G. Riesterer, who drops out of the company and is succeeded by William H. Love, of Buffalo, the officers and stockholders remain the same. Several kinds of contract work will be carried on by the firm other than that of laying asphalt pavements.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Atlantic City, N. J.—The paving bill has been signed by Governor Voorhees and is now a law.

According to a recent report the streets of Manila are perfectly straight, macadamized and have granite walks.

Kansas City, Mo.—The city engineering department will hereafter insist that asphalt be used in paving street railway tracks on all streets paved with asphalt.

A bill has been introduced in the Ohio legislature which authorizes cities of second grade, fourth class, to pave streets with vitrified brick, one-half the cost to be paid by the city and one-half by abutting property-owners. The bill was introduced by Mr. Bartlow of Butler county.

Grand Rapids, Mich.—Kent-st., between Bridge and Hastings, has been recently paved with crushed stone with such satisfactory results that another block will be laid in the same manner. If, after a year's test, the street is still satisfactory, more streets will probably be paved.

Erie, Pa.—An ordinance transferring a sum of money from the Fourth ward street-paving fund to a fund for paving the intersection of Third and Sassafras-sts. has been signed by the mayor, and Sassafras-st. will now be paved with asphalt, from Fifth to Second. The contract was let to Mayer Bros. last summer.

Kansas City, Mo.—The move to secure open specifications in street paving was defeated in the board of public works by one vote. It required the unanimous action of the board. After July 1 all asphalt paving contracts must contain a ten-year maintenance clause. An effort was made to require a ten-year maintenance clause on brick paving contracts, also, but a protest from the brick contractors resulted in the matter being deferred for a time.

CONTEMPLATED WORK.

Montgomery, Ala.—Ordinances for brick paving have been passed.

Central Falls, R. I.—Central-st., from High to Hill, will be paved.

Chester, Pa.—Market-st. will be paved with brick. Coun. Robert E. Ross.

Shelbyville, Ill.—Paving is contemplated for the public square. W. H. Silver, cy. clk.

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Worcester, Mass.—An ordinance has been adopted to pave Main-st. with asphaltina.

Charlotte, Mich.—The question of paving E. Lovett-st., with brick, is being agitated.

East Liverpool, O.—Brick paving in certain streets is favored by the council.

Waterbury, Conn.—The construction of asphalt or brick paving is contemplated.

Cedar Falls, Ia.—Vitrified brick paving is contemplated for several streets.

St. Joseph, Mo.—Paving is proposed for Seventh-st. Asphalt or brick is suggested.

Coldwater, Mich.—Brick paving is contemplated for one of the principal streets. cy. clk.

Hicksville, N. Y.—The board of supervisors contemplates the macadamizing of Broadway.

Newburg, N. Y.—Liberty-st., from Renwick to Broadway will be paved with granite or asphalt.

Logansport, Ind.—Press reports say that the question of asphalt paving is being agitated.

McKee's Rocks, Pa.—The question of bonding for $15,000 for street improvements will be voted on July 20.

Crafton, Pa.—The question of issuing $10,500 bonds for street improvements will be voted on July 26.

Newport, R. I.—Paving is contemplated for Thames-st. at an estimated cost of $25,000. Mayor Bogle.

Rockford, Ill.—The city council has, according to press reports, passed ordinances for paving five streets.

Leavenworth, Kas.—Paving is contemplated for Fifth-st. Brick, asphalt and macadam are suggested.

Winooski, Vt.—The village trustees voted, June 13, to construct concrete walks on Main and Allen-sts.

Wilmington, Del.—The street and sewer department has decided to pave a number of streets this summer.

West Hoboken, N. J.—An ordinance has been passed authorizing Trinidad lake asphalt paving for Clinton-ave.

Omaha, Neb.—A petition will be presented to council for improving Vinton-st., from Twentieth to Twenty-fourth.

Oberlin, O.—A resolution was passed, June 3. to grade, drain, pave and curb N. Main-st. Chas. Seth Brown, clk.

Oskaloosa, Ia.—The city council granted the petition of the residents in W. High-ave., June 13, for paving.

Minneapolis, Minn.—(Special.)—The gutters paved with asphalt about three years ago will be paved with brick.

Glens Falls, N. Y.—A resolution has been passed by the board of trustees for brick paving. W. J. Haskell, prest.

Sedalia, Mo. — Resolutions have been passed for paving, with brick, Ohio and Kentucky-aves. Jas. P. Quinn, cy. clk.

Troy, N. Y.—The board of county supervisors has petitioned the state engineer for about 18 miles of county roads.

Atlantic City, N. J.—The expenditure of $180,000 for paving the principal streets has been authorized.

Grand Rapids, Wis.—Bids will be asked soon, according to report, for asphalt paving; estimated cost, $22,422.

Hart, Mich.—The village council is reported as discussing the question of paving State-st., from Main to Lincoln.

Albany, N. Y.—Howard-st., from S. Pearl to Lodge, will be paved with vitrified brick and from Dodge to Eagle with granite.

Elgin, Ill.—Mayor Price contemplates paving Chicago-st., from Villa to Liberty, with brick, and, if it proves successful, will extend it.

Springfield, Mo.—A resolution was passed, June 15, to macadamize Campbell-st., from Walnut to College. G. W. Hackney, cy. clk.

Portage, Wis.—An ordinance was passed, June 20, to pave that portion of the streets now paved with cedar blocks with vitrified bricks.

Merchantville, N. J.—The property-holders have signed a petition requesting that every road in the town be paved with stone. Boro coun.

Cortland, N. Y.—Henry C. Allen, M. Am. Soc. C. E., Syracuse, N. Y., has been engaged as engineer in charge of the street paving in this city.

Philadelphia, Pa.—The construction of asphalt bicycle paths on the Walnut-st. bridge and its approaches is contemplated.

Pittsburg, Pa.—Final ordinances have been passed for paving and curbing Iowa, Ophelia, Cora and Cooper-sts. and Wright's alley.

Wallaceburg, Ont., Canada—The question of borrowing $5,000 for granolithic walks will be voted on July 6. H. E. Johnson, town clk.

Springfield, Ill.—Ordinances were passed June 10 for repaving portions of First, Allen, Washington, Edwards, Cook, Eighth and Ninth-sts. and Enos-ave.

Springfield, Mass.—The sum of $40,000 has been appropriated for paving and macadamizing. Plans have not yet been determined upon.

Marshfield, Wis.—The common council has voted to pave at least one block with crushed stone. The work will be done by contract.

Van Wert, O.—A resolution has been passed for paving Main-st. for a distance of one-half mile with brick, block or asphalt. Bids will be asked.

New Orleans, La.—An ordinance was introduced, June 17, requesting the comptroller to advertise for bids for paving Canal-st. with asphalt.

Pekin, Ill.—The construction of a stone and gravel road from the Illinois river bridge west to Orchard Mines is contemplated by the city council.

Fortville, Ind.—First-st. will be graded, graveled and concrete walks constructed. Concrete walks will be laid on S. Main and Stant-sts. also.

Chicago, Ill.—The board of local improvements ordered plans and estimates prepared, June 24, for opening Ogden-ave., from Union Park to Lincoln Park.

Meadville, Pa.—A petition has been favorably passed on to pave Terrace-st. with brick.

Watertown, Wis.—A resolution has been introduced favorable to the paving of Main-st., from the Main-st. bridge to Seventh-st., with brick. Mayor Mulberger.

Louisville, Ky.—The board of public works has under consideration the completion of Chestnut-st., from Thirtieth to Shawnee park, at an estimated cost of from $30,000 to $50,000.

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Manchester, N. H.—The city engineer estimates the cost of paving Canal-st., from Granite to Auburn, 3,952 sq. yds.; with stone block at $2.35 a sq. yd., or $9,289.20.

Sioux City, Ia.—The question of paving Third and Water-sts. and the alleys in ten blocks with brick and Sixth-st. with asphalt is being discussed by the city council.

Duluth, Minn.—The board of public works is considering the advisability of repaving the old cedar block paved streets with brick, granite or macadam. President Smith, Bd. Pub. Wks.

Laconia, N. H.—The city engineer has been instructed to prepare plans and specifications and ask for bids for constructing the proposed boulevard from Lakeport to the Weirs.

Mattoon, Ill.—An ordinance has been passed to improve about 2,800 ft. of Nineteenth-st. by grading, curbing, paving and building catch basins and inlet basins. A. C. Loomis, cy. engr.

Fulton, N. Y.—(Special.)—O. C. Breed, cy. engr., has submitted plans and estimates for 17,000 sq. yds. of brick paving on First-st. A special election was called to vote on the question.

Schenectady, N. Y.—Ordinances have been presented to council for brick paving in portions of Park-place and Dock-st.; asphalt in Delmont-ave.; grading, curbing and flagging in Guysling-ave.

Chicago, Ill.—L. E. McGann, comr. bd. local improvements, has reached a final decision regarding the streets of this city, and as a result about thirty-five miles of streets will be paved with asphalt, brick or granite.

Lafayette, Ind.—The city council has decided to pave Sixth-st. with asphalt and construct cement sidewalks on a number of streets. It is probable that considerable asphalt paving will be done in the near future.

Bloomington, Ill.—The board of local improvements has recommended asphalt paving for Center-st., from Washington to Front. The property-owners on E. Washington-st., east of the Illinois railroad tracks, have petitioned for brick paving.

Atlanta, Ga.—The street committee of council has adopted the petition asking for asphalt paving on Washington-st. The property-holders on Whitehall-st. are again discussing the question of paving for that street. J. L. Maddux.

Peoria, Ill.—Recent press reports state that resolutions have been adopted for paving Perry-st., from Cornhill to the city limits, with asphalt; and Adams, from Spring to Cornhill, and Knoxville, from Main to Hamilton, with brick.

New Rochelle, N. Y.—The board of trustees passed a resolution June 13 to investigate the cost of paving streets through which the new trolley line will pass, from the tracks to the curb, with brick; also, the cost of macadamizing the streets which were recently graded.

Indianapolis, Ind.—Resolutions were adopted June 27 for paving with asphalt Eleventh-st., from Central to College, and from College to Bellefontaine; Delaware, to Oakland-ave., with asphalt. This will be an extension of the pavement already laid in the boulevard from Lake-ave. to Glen-ave.

Kansas City, Mo.—The park board is considering a proposition, presented by Attorney Hunter N. Meriwether, for the improvement of the River Front boulevard, extending from River Front park in Kansas City, Kas., to North terrace, in this city, a distance of six miles.

Philadelphia, Pa.—The $11,200,000 loan bill for public improvements has passed both branches of the city council. About $2,500,000 will be devoted to street repairs and paving, $900,000 for abolishing grade crossing at the Philadelphia & Trenton R. R. tracks, $600,000 bridges, $500,000 for sewers.

Kansas City, Kas.—Resolutions have been passed for paving as follows: American bituminous rock asphalt, on concrete, Seventh-st., from Oakland-ave. to Parallel-ave.; Pittsburg brick on concrete, Darby-ave., from Lafayette-ave. to Ninth-st.; Oakland-ave., from Sixth to Seventh; curbing Central-ave., from State to Lime-st., with natural limestone curbing. Geo. E. Yeager, cy. clk.

Milwaukee, Wis.—The East Side aldermen and Samuel Brockman, comr. of pub. wks., decided June 11 to recommend that asphalt paving be constructed on the East Side as follows: Broadway, from Mason to Wisconsin; Oneida-st., from E. Water to the river; E. Water, from Biddle to Johnson; Juneau-ave., from Jefferson to Prospect-ave., and with brick, from Jackson to Van Buren; Hackett-ave., from Newbury boulevard to Milwaukee-Downer college. Improvements are being considered for the West Side as follows: Asphalt—Fifth-st., from Grand-ave. to Wells; Grand-ave., from Twenty-seventh to Western; Eleventh-st., from Vliet to Walnut. Brick—Grand-ave., from Fourth to Eighth; Chestnut-st., from Third to Seventh; Vliet-st., from Twelfth to Twentieth.

CONTRACTS TO BE LET.

Washington, D. C.—Bids are asked until July 23 for laying cement sidewalks. Dist. Comrs.

Mt. Vernon, N. Y.—Bids are asked until July 5 for grading Crary-ave. William N. Hoyt, cy. clk.

West Union, O.—Bids will be received until July 8 for constructing turnpikes. J. M. Wittenmeyer, co. audt.

Madisonville, O.—Bids will be received until July 11 for building a macadam road. Bennett Carter, vil. clk.

Petoskey, Mich.—Sealed proposals will be received until July 5 for grading Liberty-st. Geo. W. McCabe, cy. clk.

Athens, O.—Sealed proposals will be received until July 9 for the improvement of Vine-st. W. B. Golden, vil. clk.

Salem, O.—Sealed proposals will be received until July 11 for brick and asphalt paving. F. W. Allison, cy. clk.

Ridgefield, N. J.—Bids are asked until July 12 for 3,000 lineal feet of macadam road

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ceived until July 7 for 20,000 square yards of brick paving on W. North-st. C. E. Lynch, cy. clk.

Mansfield, O.—Sealed proposals will be received until July 9 for improving Adams-st., from Orange to Diamond. F. M. Remy, cy. clk.

Freehold, N. J.—Bids are asked until July 6 for constructing 7,870 feet of gravel road. John D. Honce, clk. bd. of freeholders.

Swanton, O.—Sealed proposals will be received until July 11 for 4,500 square yards of brick paving. F. H. Aldrich, corporation clk.

Columbus, O.—Sealed proposals will be received until July 12 for repairs and reconstructing seven roads. W. H. Halliday, co. audt.

Evansville, Ind.—Sealed proposals will be received until July 16 for paving three alleys with brick. Geo. W. Swearingen, clk. B. P. W.

Burlington, Ia.—Sealed proposals will be received until July 4 for paving, with brick, South, North and Arch-sts. Emmett Steece, cy. engr.

South Windsor, Conn.—Bids are asked until July 2 for grading and macadamizing the Ellington road. Harry S. Powers, 1st selectman.

St. Louis, Mo.—Bids are asked July 5 for grading and granite block paving on Cook-ave. and other streets. Robt. E. McMath, prest. B. P. I.

New Rockford, N. D.—Bids will be received until the July meeting of the county board for grading several roads. F. S. Dunham, co. audt.

Bridgeport, O.—Bids will be received in July for furnishing and constructing brick paving, curbing, etc. Hoge & Hix, engrs., Wheeling, W. Va.

New Ulm, Minn.—Sealed proposals will be received until July 5 for grading certain streets and constructing culverts. Louis Schilling, cy. clk.

West Shoals, Ind.—Sealed proposals will be received until July 6 for constructing gravel and macadam roads. Horatio Barryman, co. audt.

Davenport, Ia.—Sealed proposals will be received until July 2 for laying temporary and permanent sidewalks. E. W. Boynton, comr. pub. wks.

Cleveland, O.—Bids are asked until July 7 for paving with brick and curbing Duane-st., from Franklin to Wooodbine. Geo. R. Warden, dir. pub. wks.

Kansas City, Mo.—Sealed proposals will be received until July 7 for macadamizing two miles of the Hickman's Mills road. Thos. F. Callahan, co. surv.

Rockville, Ind.—Sealed proposals will be received until July 8 for grading, draining, graveling and bridging about 11 mis. of roads. E. H. Owen, co. audt.

Indpendence, Mo.—Sealed proposals will be received until July 1 for 7,500 square yards of asphalt paving on the public square. H. H. Pendleton, cy. engr.

Toledo, O.—Sealed proposals will be received until July 11 for paving the sidewalks in Pennsylvania-ave., Michigan and Pagan-sts. with cement. L. A. Hull, cy. clk.

South Bend, Ind.—Sealed bids will be received until July 5, for furnishing road supplies needed by the county during the year. John F. Vernon, co. audt.

Jamestown, N. D.—Sealed proposals will be received until July 9 for grading, graveling, masonry and bridges on the Bowers and Moyer pikes. Samuel Craig, engr.

Wapakoneta, O.—Sealed proposals will be received until July 11, for paving Bridge-st. with brick, with cement curbing and paving the sidewalks with cement. Geo. A. Tremel, town clk.

Ashland, O.—Bids will be received July 30, according to report, for constructing about 26,000 square yards of brick or asphalt paving on Cottage and Main-sts. F. L. Neiderheiser, cy. engr.

Des Moines, Ia.—Bids will be received until July 2 for 2,700 feet of curbing on Forest-ave., 4,600 square yards brick paving on Tenth-st. and 20,000 square yards of brick paving on Cottage Grove-ave. Bd. Pub. Wks.

Cincinnati, O.—Bids are wanted until July 22 for grading of grounds, roads and river bank, revetment of slopes and excavation of clear well, near California. Aug. Herrmann, prest. bd. trus., comrs. of w. w.

Canton, O.—Sealed bids will be received until July 2 for paving W. Tenth-st. fr. S. Market to S. McKinley-ave. with vitrified paving block on gravel foundation and constructing curbing. Louis N. Ley, cy. clk.

Pasadena, Cal.—Sealed bids will be received until July 5 for a franchise to erect and maintain over certain public streets and places an elevated cycleway road and path for the use of bicycles. Heman Dyer, cy. clk.

Des Moines, Ia.—Sealed proposals will be received until July 2 for paving Tenth-st. and Cottage Grove-ave. with brick on concrete and for curbing Eighth-st. with Portland cement curbing. G. A. Eberhart, C. E. Campbell, B. P. W.

Ft. Wayne, Ind.—Bids will be received until July 7 for paving with asphalt the following streets: High-st., from Wells-st. to St. Mary's-ave.; Cass-st., from Wells to 6th; Fairfield-ave., from Main to Jefferson. Cy. Engr. Randall.

Cincinnati, O.—Sealed bids will be received by Edwin C. Winter, clk. board of education, Warsaw special school dist. No. 1, until July 18 for grading and paving the basement in the school house in Delphi twp. Edwin C. Winter, care Early & Daniel n. w. cor. Sixth and Harriet-sts.

Ottumwa, Ia.—Sealed proposals will be received until July 5 for paving W. 2d-st., from Court to Clay, with asphalt on concrete foundation, with Portland cement curbing, and vitrified brick paving for a distance of 3½ on each side of the street car track. Bids will be received the same day for paving E.

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Imp. dist. No. 15—7,065 square yards brick paving, 2,216 lineal feet combined concrete curb and gutter, 3,000 lineal feet 6x16-inch concrete curb, 4,000 cubic yards earth excavation. J. J. Ryan, cy. engr.

Washington, D. C.—Bids are asked until July 9 for paving certain streets with asphalt and asphalt block. Bids will be received at the same time for furnishing terra cotta sewer pipe, vitrified invert block, vitrified invert brick, sand, gravel, granite, curbing, asphalt paving blocks, vitrified paving blocks or bricks, sewer bricks and natural and Portland cements. John B. Wright, John W. Ross, Lansing W. Beach, Comrs. D. C.

Georgetown, O.—(Special.)—C. M. Gordon, co. engr., says bids will be received until July 6 for the Bald Point repair. This county contemplates building several miles of pike this summer. The county engineer has just finished the permanent survey of the Shinkles Ridge pike, 4 miles, and will have the specifications ready for advertisement in a few days. Any information desired will be furnished by the engineer.

CONTRACTS AWARDED.

Milton, Mass.—The contract for widening certain streets was awarded to W. H. Magué of West Newton for $71,000.

Lansing, Mich.—Woodcock & Kneal was awarded the contract June 21 for nearly a mile of brick paving for $29,000.

Houston, Tex.—The contract for repairing the Harrisburg gravel road was awarded June 7 to Hipp & Key at $1.50 per cu. yd.

Atlanta, Ga.—The Warren-Scharf Asphalt company was awarded the contract for paving Auburn-ave.

North Adams, Mass.—The contract for brick paving in four streets has been awarded to W. H. Lally & Co. for $15,120.

Chester, Pa.—Michael Hogan & Son secured the contract for paving Edgmont-ave. with brick at $1.48 a sq. yd.

Sandusky, O.—The contract for paving Wayne-st. with Newcastle asphalt block has been awarded to M. J. Callan for $32,045.

Allegheny, Pa.—The Park Fire Clay company, Pittsburg, was awarded the contract for 1,000,000 paving brick at $7.50 per 1,000.

LaSalle, Ill.—The contract for paving five streets with brick was awarded to Charley Bros. of this city for $64,204.

Hancock, Mass.—The contract for constructing a macadam road was awarded to Harris & Letterney of Boston for $2,973.

Athens, O.—Davis & Archer of Bellaire, O., have been awarded paving contracts, according to reports, for $6,380.07.

Cambridge, O.—The contract for paving Wheeler-ave. with brick was awarded to Adams Bros. of Zanesville for $22,434.92.

Bluffton, Ind.—The Warren-Scharf Asphalt paving company was awarded the contract for constructing a road from this place to Eagle Bay was awarded to John H. Nelson and G. G. Harter for $14,871.

Old Forge, N. Y.—The contract for constructing a road from this place to Eagle Bay was awarded to John H. Nelson and G. G. Harter for $14,871.

Rochester, N. Y.—The contract for asphalt paving on Yale and Linden-sts. was awarded June 20 to the Warren-Scharf Asphalt Paving company for $18,524.35.

Bay City, Mich.—The contract for paving Center-ave., from Madison to Johnson-st., with brick on concrete, was awarded June 13 to Hugh Campbell for $34,404.

Albany, N. Y.—Brick paving contracts have been awarded as follows: Green-st., 10,520 sq. yds., T. Henry Dumary, $2.10 a sq. yd. First-st., 7,400 sq yds., Mulderry Bros., $1.79.

Hagerstown, Md.—The contract for 6,500 sq. yds. of brick paving was awarded to E. G. Buck, of Bedford City, Va., at $1.28 a sq. yd. Clearfield brick will be used.

Jackson, Mich.—The board of public works recommended June 20 that the contract for brick paving be awarded to T. C. and H. M. Brooks, of Detroit, at $1.26 a sq. yd.

Minneapolis, Minn.—The contract for paving portions of Fourth and Third-sts. and Fourth and Third-aves., with asphalt has been awarded to the Ayres Asphalt Paving company at $2.15 a sq. yd.

Patchogue, (L. I.) N. Y.—The Eastern Brick Paving company, Catskill, N. Y., was awarded the contract for paving Main-st. with brick at $1.35 a sq. yd. for paving and 33 cts. per lin. ft. for curbing.

Florence, Ala.—T. F. Johnson secured the contract for grading and graveling Court, Mobile and Pine-sts. and Morrow-ave. at prices ranging from 14½ to 36¼ cts. per running foot.

Oskaloosa, Ia.—Brick paving contracts have been awarded as follows: N. C-st., Peter Nelson, $1.37 a sq. yd.; College-ave., O. P. Herrick, Des Moines, Ia., $1.36⅞; Fourth-ave., Geo. Carlon & Son, $1.36⅞.

Freeport, Pa.—The contract for paving Fifth-st. was awarded to Sweeney & Houston of Pittsburg at 92 cts. a sq. yd. for Mack brick, 40 cts. per lin. ft. for 15-in. pipe sewer and $15.60 each for sewer inlets.

Savannah, Ga.—The contract for repair and maintenance of asphalt paved streets for three years, with the privilege of five years has been awarded to the Southern Asphalt Paving company of Baltimore at $2.15 a sq. yd.

Meridian, Miss.—The contract for 10,000 sq. yds. of brick paving on Twenty-second-ave. has been awarded to C. H. Budd of St. Louis, Mo., at $1.80 a sq. yd. for paving, 25 cts. per cu. yd. for grading and 50 cts. per lin. ft. for granite curbing.

Des Moines, Ia.—Contracts were awarded, June 9, as follows: Curbing, 8th-st., Magden & Sheely, 30.9 cts. per lin. ft.; paving

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pany of Baltimore at $18.72 per 100 sq. ft.; total, $30,000. The Barber Asphalt company bid $19.44 and the Warren-Scharf Paving company $22.23.

Lima, O.—The contract for 30,000 sq. yds. of paving was awarded, June 9, according to local reports, to O'Brien & Barr of Lima, as follows: Excavation, 28 cts.; concrete, 40 cts.; street curb, 49 and 66 cts.; cir. curb, 70 cts.; catchbasins, $18; extra haul, 3 cts.; Metropolitan blocks, 75 cts.

Fulton, N. Y.—(Special.)—O. C. Breed, cy. engr., says the contract for paving, on which bids were received May 27, has not yet been awarded. A committee was appointed to visit cities and inspect paving. The lowest bid was submitted by the New York Brick and Paving company of Syracuse at $1.97 a sq. yd.

Toledo, O.—The contract for paving Woodville-st. with with granite block was awarded, June 16, to Garrigan Bros., for $34,999.52; Second-st., Kerling Bros., $5,384.31; Kenilworth-ave., H. P. Streicher, $5,495.61½. The awarding of the contract for paving Batavia-st. was deferred for one week.

Ottawa, Canada—The contract for street paving was awarded to the Canadian Granite company, as follows: Alcatraz asphalt, tracked streets, $2.75; untracked streets, $2.65; guarantee fifteen years. The Warren-Scharf Asphalt Paving company bid $2.87 for tracked streets and $2.60 for untracked streets, with a fifteen-year guarantee.

Louisville, Ky.—The Barber Asphalt Paving company was awarded a contract, June 5, for street reconstruction for $22,000. Bids were received, June 21, for asphalt paving. The Barber Asphalt Paving company bid $16.83 and $15.69 per 100 ft. square respectively for first and second-class paving, and the Southwestern company bid $17. The contract has not been awarded.

Wilmington, Del.—Contracts for brick paving were awarded as follows: Athens Brick company, 1,139 sq. yds., 90 cts. a sq. yd.; George H. McCall company, Monsello blk., 3,480 sq. yds., 84 cts.; J. M. Solomon, Reading, shale, 7,185 sq. yds., 81 cts.; McMahon, Porter & Co., fire brick, 1,500 sq. yds., 85 cts.; Townsend Block and Contracting company, 3.150 sq yds., 97 cts.; Charles Warner company, 4,956 sq. yds., 97 cts.

Buffalo, N. Y.—The Barber Asphalt Paving company was the lowest bidder, June 3, for the following work: Surfacing or repaving Court-st., from Niagara-st. to the Upper Terrace—surfacing, Trin. asp., $4,618; paving Ashland-ave., between Lafayette and Delavan-aves., $4,347; resurfacing Ferry-st., between Main and Ellicott, $1,988.

Syracuse, N. Y.—Bids have been received for paving with asphalt or asphaltina as follows: The Asphaltina Construction company, $12,675.90; the Columbia Construction company of New York City, $13,727.80; the Empire Contracting company, $10,075, and the Warren-Scharf Asphalt Paving company, New York City, $13,682.38.

Hornellsville, N. Y.—The contract for brick paving was awarded, June 6, to James McCloud & Co. of Columbus, O., as follows: 2,100 cu. yds. excavation, 20 cts. a cu. yd.; 5,480 sq. yds. brick, on concrete, $1.30; 480 sq. yds. brick on sand foundation, $1.25; 1,830 lin. ft. curb, 35 cts.; 110 lin. ft. circular curb, 55 cts.; 200 ft. curb reset, 15 cts.; 1,800 lin. ft. 4-in. drain tile, 6 cts.; total, $8,963.

Troy, N. Y.—Paving contracts were awarded, June 14, as follows: Resurfacing Fifth-ave., between Broadway and Hoosick-sts., 11,000 sq. yds., Geo. McDonald, Trin. asphalt, $1.65 a sq. yd.; curbing, 66 cts.; Church-st., from Ferry to Division, Patrick Russell, Metropolitan fire clay block, $1.60; Middleburgh-st., from River to North, Mack brick $1.92; Tenth-st., from Hoosick to Middleburgh, Wm. Fitzsimmons, Catskill brick, $18,473.50.

Omaha, Neb.—The contract for widening Sixteenth-st., from Douglas to Izard 12-ft. and for raising and paving with asphalt the old cobblestone paved sewer gutters, was awarded, June 3, to J. B. Smith at $2.75 a sq. yd. John Cochrane secured the contract for grading Twenty-sixth-st. at 12 cts. a sq. yd., and Hugh Murphy the contract for curbing Yates-st., from Fifteenth to Sixteenth, with Colorado sandstone, at 55 cts. per ft.

San Francisco, Cal.—Paving contracts have been awarded as follows: Chestnut-st., from Hyde to Leavenworth, Daniel O'Connor; Leavenworth, Lombard to Chestnut, Flynn & Treacy; curbing and paving Pierce, from Oak to Page, City Street Improvement company; Waller, from Pierce to Scott, San Francisco Paving company; sidewalks, Market, from Sanchez to Noe, Gray Bros.; macadamizing Third-ave., from Clement to California, P. McCaffagan.

Akron, O.—Bids have been received for sheet asphalt paving, with 5, 10 and 15 yrs. guarantee, as follows: Barber Asphalt Paving company, New York City, 6-in. concrete base, $11,445.84, $12,822.34 and $13,923.54; 4-in. concrete, $10,785.12, $12,161.62 and $13,262.82; Ayres Asphalt Paving company, Zanesville, O., 6-in. $10,965.98, $12,342.48 and $14,214.52; 4-in. concrete, $10,470.44, $11,957.06 and $14,324.64. Brick paving, France & Hassler, Akron, brick, $19,093.80; S. C. McGown, Akron brick, $20,201.45; Canton brick, $20,519.03; Herring & Son, $20,108.26; Akron or Canton brick; P. T. McCourt, Akron brick, $19,512.21; Canton brick, $19,988.58.

Albany, N. Y.,—T. Henry Dumary was awarded the contract, June 6, for paving Second-st., from Quail-st. to New York Central-ave., with brick, at the following prices: Nine thousand three hundred sq. yds. paving, 65 cts.; 5,390 ft. straight and 100 ft. circular granite curb, 25 cts.; relaying 100 sq. yds. pavement on sand, 45 cts.; 5 sq. yds. on concrete, 50 cts.; 50 lin. ft. curb on sand, 20 cts.; on concrete, 60 cts.; 51,600 sq. ft. new brick sidewalk, 8 cts.; 11,900 sq. ft. 4-ft. flag sidewalk, 14 cts.; relaying 9,800 ft. sidewalk, 3 cts.; 7 receiving basins, $60 each; 400 lin. ft. trench and 6-in. pipe, 30 cts.; 25 6-in. bends, 40 cts. each; labor on backfilling, $1.50; total, $23,624.

Philadelphia, Pa.—The Vulcanite Paving company was awarded contracts for paving a number of streets with sheet asphalt on broken stone, base and binder, at $1.20 to $1.28 per sq. yd. Richardson & Ross secured four streets at $1.24 and $1.34 a sq. yd. Contracts for paving a number of streets with Cape Ann granite blocks were awarded to D. J. McNichol at $2.34 a sq. yd, and for vitrified paving to Thomas Cunningham at $1.37 to $1.43, and George A. Neal at $1.35 to $1.49 a sq. yd. The prices are considerably lower than they have been heretofore, which fact is attributed by Director Thompson to the present policy of free competition for such improvements.

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Zanesville, O.—Bids were received for paving recently as follows: T. T. Mulligan, Ironton, $25,120.96; Greenville Construction company, Greenville, $29,716.24; Adams Bros., Zanesville, $22,434.92; McCourt & Davidson, Akron, $30,755.99; M. McCarren & Co., Detroit, Mich., $23,369.08; Davis & Archer, Bellaire, $37,745.09; Henry Ganz, Columbus, $24,-305.17. The bids for furnishing brick were as follows: John C. Boler, Zanesville, 50c. per sq. yd; Charles J. Deckman, Malvern, O., 46½c. per sq. yd.; T. B. Townsend Brick company, Zanesville, 44c. per sq. yd.; Harris Brick company, Zanesville, 47c. per sq. yd.

Detroit, Mich.—Bids were received June 13 for asphalt paving in four streets. The lowest bid was submitted by the Barber Asphalt company, which bid $1.90 a sq. yd., exclusive of curbing, on Stimson-place, the eastern market and Randolph-st., from Monroe to Gratiot, and the contracts were awarded to the company. The American Construction company (formerly the Western Bermudez) bid $2.55 for paving Lawrence-ave., but the contract was held up on account of the bid being so high. Contracts for cedar block paving on concrete, with Medina curbstone, was awarded as follows: Seventh-st., $1.44, and Champlain-st., $1.48, Geo. E. Curry & Co.; Riopelle-st., $1.17, H. Merdian; Trumbull-ave., $1.13, Talbott Paving company; St. Aubin-ave., $1.26, John McLaughlin.

Allegheny, Pa.—Paving contracts were awarded June 7 as follows: A. V. Purnell, $7,218; grading, paving and curbing of Lithgow-ave., Ligonier block, brick sidewalks, Kreps Coal and Sand company, $4,552.50; grading, paving and curbing of Overlook-st., Ligonier block, vitrified brick sidewalks, Kreps Coal and Sand company, $4,390; grading, paving and curbing of Diana-st., sheet asphalt, brick sidewalks, Sicilian Asphalt Paving company, $3,658.50; grading, paving and curbing of Page-st., sheet asphalt, brick sidewalks, Sicilian Asphalt paving company, $4,860.

Jamestown, N. Y.—Bids were received June 18 for about 40,817 sq. yds. of brick paving, as follows: Gust. Berland, gravel concrete foundation, $70,664.38; broken stone foundation, $80,484.43. Jamestown Construction company—Gravel concrete, $70,094.21; broken stone, $83,015.46. Alcatraz Paving company, Philadelphia—Gravel concrete, $75,-169.10; broken stone, $82,882.50. James R. Van Camp, Olean, N. Y.—Gravel concrete, $75,129.99; broken stone, $80,812.44. Henry Garity and Chas. Varnum—Gravel concrete, $69,180.47.—Horace W. Walker—Gravel concrete, $68,117.49; broken stone, $81,038.68. German Rock Asphalt company, Buffalo—Gravel concrete, $70,185.63; broken stone, $73,286.73. A. N. Broadhead and G. E. Maltby—Gravel concrete, $68,289.18; broken stone, $81,233.58.

Kansas City, Mo.—Paving contracts were awarded as follows: Thirty-first-st., from Grand-ave. to Holmes, Barber Asphalt Paving company, $2.12 or $21,690.60; Twenty-fourth-st., from Southwest boulevard to Fairmount-ave., Parker-Washington company, $1.655 or $12,154.50; alley between Main pany in this city. The Barber Asphalt Paving company secured several contracts June 22 at $2.10 and $2.12 a sq. yd. Other contracts awarded June 22 were: Reconstructing and paving Eleventh-st. with brick, Parker Washington company, $1.85 a sq. yd.; Askew-ave., brick, R. J. Boyd Paving and Construction company, $1.50; Twenty-third-st., brick, M. Mense, $1.54½; Twenty-eighth-st., brick, Trestrail Paving company, $1.53½. Bids were received for asphalt paving on Sixteenth, Brooklyn, Seventeenth and Euclid-sts., but the awarding of the contracts was postponed until July 8. The Barber Asphalt company bid $2.12 on those streets and J. R. Dennison & Co. $2.08 and $2.09, but as this company has not yet filed bonds for contracts awarded it May 28 the board of public works decided that it would become satisfied of the company's ability to carry out the former contracts before awarding it more.

SEWERS.

Clinton, Ia.—Plans have been prepared for a sewerage system in Ash-st., which will require about three mls. of brick and pipe. C. P. Chase, cy. engr.

New Martinsville, W. Va.—A sewerage system will be constructed. L. J. Miller, C. E., of Martin's Ferry, O., has made surveys preparatory to the work.

San Rafael, Cal.—The question of issuing $26,000 bonds for building 8,000 ft. of pipe sewers will be voted on July 16. Geo. L. Richardson, cy. engr.

Bath-on-the-Hudson, N. Y.—The village trustee has ordered sewers constructed in First and Broadway-sts., from Central-ave. to Washington-st.

Worcester, Mass.—The question of appropriating $70,000 for continuing the construction of the separation system on the west side is being considered.

Herkimer, N. Y.—The construction of a separate system for storm water drainage has been recommended by F. K. Baxter, Utica, N. Y. E. W. Sluyter, clk. mun. comn.

Toledo, O.—Ordinances have been approved for the construction of a brick sewer in Eastern-ave., and for pipe sewers in other streets and alleys. Lem P. Harris, cy. clk.

Columbus, O.—A resolution was adopted June 13 to construct the several lines of sewers in sub-sewer district I of main sewer district No. 1. John T. Barr, cy. clerk.

Philadelphia, Pa.—The council's survey committee decided June 7 to favorably recommend an appropriation of $50,000 for constructing branch sewers in various parts of the city.

Salem, Mass.—The board of aldermen referred to the sewerage committee June 5 an order to appropriate $250,000, to be raised on a loan, to establish a chemical plant to treat sewage.

Racine, Wis.—Plans and estimates have been adopted for a sewer in St. Patrick-st., and plans and specifications will be made for sewers in Prospect and Howland-aves. Cy.

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completed. About 15.48 mls. of 6 to 30-in. pipe sewers will be required; estimated cost, $108,229. Edwin M. Capp, cy. engr.

Andover, Mass.—The proposed sewerage system will include 6 mls. of 15 to 6-in. pipe sewers, 1 mi. 12-in. cast iron pipe, an inverted syphon, six acres of filtration beds, settling, etc.; estimated cost, $80,000. Wm. L. Jenkins, chrmn. com.

Newark, N. J.—Ernest Adam, city surveyor, submitted four plans to the board of works June 21 for a sewerage system for the West Side. The estimated cost of the plans are: No. 1, $103,676; No. 2, $141,167; No. 3, $218,236; No. 4, $325,653. Further consideration was postponed one week.

Altoona, Pa.—(Special.)—Harvey Linton, cy. engr., says estimates have been made for a needed storm sewer system, to cost $43,000, to be built in sections, as required. First section, 7 and 8 ft. sewers; to cost for 1,311 ft., about $1,400. This work will hardly be commenced this year, as no appropriations for it have been made.

Buffalo, N. Y.—The estimated cost of abating the Hamburg canal nuisance is $705,873. The plan is to fill up the canal, and the sewage, of which it is the present outlet, will be carried off by a system of 13 new sewers, which will empty into a pumping station, where the refuse will be pumped into the Swan-st. trunk sewers. Cy. Engr. Bardol.

Johnstown, N. Y.—Olin H. Landreth, C. E., of Union college, Schenectady, N. Y., has been engaged to report on a comprehensive plan of sewerage and sewage disposal for the entire city. Owing to the large amount of tannery waste and chemicals which the system will have to take care of ultimately, the plan is somewhat complicated. Since 1882 the city has been sewering into Cayadutta creek, which runs through the city. An injunction, which was granted a mill-owner and which was recently affirmed by the court of appeals, has been temporarily suspended by agreement with the complainant, but the city is anxious to provide a permanent system by which it may comply with the injunction and stop the expense of the payments to the mill-owner.

CONTEMPLATED WORK.

Fowler, Ind.—The question of sewage disposal is being considered.

Grand Rapids, Mich.—A sewer has been recommended for Sheldon-ave.

Kingston, Pa.—Plans have been prepared for constructing sewers.

Oil City, Pa.—The construction of a sewer at a cost of $10,000 is contemplated.

Waseca, Minn.—Plans and specifications have been made for a sewerage system.

Stockton, Pa.—A system of sewers will be constructed at once. Town Solicitor Miller.

Taylorville, Ill.—The construction of a sewer, at a cost of $15,000, has been authorized.

Deadwood, S. D.—The establishment of a sewerage system on Stewart-st. is contemplated.

Newport News, Va.—Bids will soon be asked for constructing the proposed sewerage system.

Goshen, Ind.—The construction of one mile of 30-in. pipe sewer is contemplated. Cy. Engr. Cooper.

McKees Rocks, Pa.—An ordinance providing for $10,000 for sewer extensions will be voted on July 20.

Pittsfield, Mass.—The board of public works voted June 13 to extend the sewer system on Tyler-st.

Fergus Falls, Minn.—Separate bids will be taken for a sewer on Whitford and Cleveland-aves. Cy. clk.

Seymour, Ind.—The construction of a pipe sewer, 2,800 ft. long, is contemplated at a cost of $2,473.

Paterson, N. J.—The construction of sewers in sundry streets has been ordered. Thos. McLean, cy. st. comr.

Williamsport, Pa.—Sewers are proposed for W. Fourth-st., First and Erie-aves. and Oliver-st. Mayor Mansel.

Newton, Kas.—The construction of sewers, at a cost of about $7,000, is contemplated. Dr. S. D. Bennett, chrm. com.

East Hartford, Conn.—Surveys have been made for sewers in the Meadow district. Jos. Goodwin, town clk.

Des Moines, Ia.—A sewer is proposed for the southeast portion of the city. Geo. M. King, cy. engr.

Wallingford, Conn.—The question of constructing a trunk sewer has been favorably voted on by this borough.

Bellevue, Pa.—This place has voted to issue $48,000 bonds for sewer construction. Wm. Martin, chrmn. com.

Hamilton, O.—Plans for a storm sewer in Market-st., from Water to Fourth, have been filed. M. O. Burns, cy. clk.

South Bethlehem, Pa.—The question of issuing $100,000 in bonds for a sewerage system will be voted on July 26.

Columbus, Ga.—The question of issuing $150,000 bonds for sewer and bridge construction will be voted on Aug. 19.

Crafton, Pa.—The question of issuing $30,000 bonds for sewers and street improvements will be voted on July 26.

Schenectady, N. Y.—The construction of sewers in E. Liberty-st., is proposed. Chrmn. Holtzman of rds. and bridge com.

Bushnell, Ill.—The question of constructing a sewerage system is being considered by the council. Ald. Wierather.

Lancaster, Pa.—This city has appropriated $20,000 for sewer extensions and improvements. Edwin S. Smeltz, cy. clk.

Sioux City, Ia.—The construction of 20-in. tile and 24-inch. pipe storm sewers has been recommended by St. Com'r Siman.

Brewer, Me.—The question of issuing $10,000 bonds for a sewerage system has been favorably decided upon. Mayor Sargent.

South Bethlehem, Pa.—The question of issuing $100,000 sewerage bonds will be voted on July 26. R. E. Neumeyer, boro engr.

Cleveland, O.—Resolutions have been adopted to construct sewers in a large number of streets. Howard P. Burgess, cy. clk.

Holyoke, Mass.—The question of constructing a sewer to drain the new Highlands is being agitated; estimated cost, $75,000.

Marshall, Mich.—H. E. Riggs, C. E., Toledo, O., has been engaged to prepare plans for the sewerage system. Ald. Joy and Anson.

Alexandria, Ind.—The construction of 10 and 12-in. pipe sewers in a number of streets is contemplated. J. W. Tomlinson, cy. clk.

Waycross, Ga.—This city will vote, July 9, on the question of issuing $50,000 bonds for a sewerage system. R. P. Bird, clk. coun.

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Wausau, Wis.—A resolution has been passed for the construction of a sewer on Forest-st., from Fourth to Seventh. Chas. F. Beck, cy. clk.

Mattoon, Ill.—An ordinance has been passed by council for building catch basins and inlet basins in Nineteenth-st. A. C. Loomis, cy. engr.

Fall River, Mass.—The treasurer has been authorized to raise $100,000 for the extension of sewer outlets. Phil D. Borden, cy. engr.

CONTRACTS TO BE LET.

Elkins, W. Va.—Bids will be received until July 6 for constructing a sewer. W. W. Mills, recorder.

Le Sueur, Minn.—Bids will be received until July 8 for constructing a sewer. Theo. G. Mahler, cy. clk.

Roanoke, Va.—Bids will be received until July 16 for constructing sewers. J. H. Wingate, cy. engr.

Los Angeles, Cal.—Bids will probably be received July 5 for constructing three alley sewers. Cv. trustees.

Owosso, Mich.—Bids will be received, July 6, for the construction of a sewerage system in West Owosso.

Shelby, O.—Bids are asked until Aug. 1 for constructing sewers. J. B. Weddell, engr. in charge, Mansfield, O.

Gilmore City, Ia.—Bids will be received until July 5 for laying 470 ft. of 8-in. tile on Main-st. Town coun.

Aurora, Ind.—Bids are asked until July 2 for constructing a sewer in Second-st. and sewers in several alleys. J. J. Backman, cy. clk.

Rat Portage, Ont.—Bids will be received until July 6 for making sewer connections. D. L. Mather, chrmn. B. P. W.

Plattsburg, N. Y.—Bids are asked until July 5 for constructing sewers in several streets. Lee Rockwell, vil. clk.

Washington, D. C.—Bids are asked until July 9 for furnishing sewer pipe, brick, cement, etc. John W. Ross, dist. com.

Jefferson City, Mo.—Bids will be received until July 5 for constructing a sewer in dist. No. 4. Cy. Engr. Harding.

Chicago, Ill.—Sealed proposals will be received until July 5 for constructing sewers. L. E. McGann, prest. bd. local imp.

LaCrosse, Wis.—Bids will be received until July 2 for constructing a 12 and 15-in. pipe sewer on Fourth-st., between Cass and Market.

Mt. Vernon, N. Y.—Bids are asked until July 5 for constructing pipe sewers in sundry streets. Wm. N. Hoyt, cy. clk.

Wellsburg, W. Va.—Sealed proposals will be received until July 5 for laying a sewer in Liberty-st. E. A. Sheets, chrmn. B. P. W.

Avalon, Pa.—Bids are asked until July 5 for constructing 24-8-in. pipe sewers in a number of streets. J. A. Toy, chrmn. com.

Lancaster, N. Y.—Bids are asked until July 7 for making plans for a sewerage system [illegible] disposal plant. Geo. Bingham

received until July 5 for constructing five blocks of 18 and 24-in. pipe sewers. Louis Schilling, cy. clk.

Chicago, Ill.—Sealed proposals will be received until July 5 for constructing a sewer in Fair-ave., from Seventieth to Sixty-eighth-st. L. E. McGann, comr. pub. wks.

Savannah, Ga.—Sealed proposals will be received until July 5 for constructing one mile of brick sewer and 49 miles of pipe sewers with appurtenances. Clk. council.

Lamberton, Minn.—Sealed proposals will be received until July 7 for laying 552 ft. of 10-inch sewer and for taking up and relaying 203 ft. of sewer. J. H. Gebhard, vil. rec.

Huntington, Ind.—Sealed proposals will be received until July 12 for constructing a 1[illegible] and 10-inch pipe sewer on Etna-ave., from Jefferson to Fredericka-st., with manholes, catch basins and appurtenances. Frank Guthrie, cy. C. E.

Muscatine, Ia.—Bids will be received until July 5 for 618 ft. of 24x38 two-ring brick sewer; 1,012 ft. of 28x42-inch two-ring brick sewer; 300 ft. lin. ft. of 10-inch pipe storm water connections; 140 ft. 6-inch sewer branches; 10 receiving basins; one stone mason outlet. Bids were received for this work June 16, but upon the consideration of the proposals none of them were found to be made in conformity to the instructions, or in legal manner, and the council ordered all bids rejected. J. J. Ryan, cy. engr.

CONTRACTS AWARDED.

Cambridge, O.—Adams Bros., of Zanesville, O., secured the contract for building sewers for $9,413.05.

Meridian, Miss.—The contract for constructing sewers was awarded to Burkhalter & Co., of Birmingham., Ala., for $5,200.

Little Falls, N. Y.—The contract for constructing a sewer in Loomis-st. was awarded to Hallinan Bros. for $14,430.

Meadville, Pa.—James McAffee & Co., Allegheny, was awarded the contract for a storm sewer on N. Main-st. for $1,659.30.

Lexington, Ky.—The contract for constructing the sewer at the asylum was awarded June 15 to Thomas Smith & Son for $2,650.

St. Louis, Mo.—The contract for repairing and reconstructing sewers was awarded June 17 to John L. Kelly for $13,890.

Milwaukee, Wis.—Geo. E. Zimmerman secured the contract for laying sewers in Concordia, Providence and Cambridge-aves. and Bartlett-st.

Chicago, Ill.—Sewer contracts have been awarded to Ed Connor, Joy & Co., Jas. Healy, Simon Ryan, Andrew Maloney and Thos. J. Burke.

Winooski, Vt.—The lowest bid presented for constructing a sewage system was that of M. J. Fitzpatrick, of Plattsburg, N. Y., $13,212.

Crookston, Minn.—The contract for the sewer on Main-st. was awarded to Andrew [illegible]

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cured contracts for building sewers for $8,724.80. Maloney & Peterson was awarded the contract for the Douglas-st. sewer extension for $4,808.3.

Watertown, Wis.—The contract for building sewers during the year were awarded to Wm. Gorder at 42 cts. per lin. ft. for 8-in. pipe sewers; $25 for manholes; $27 for flushtanks.

New Haven, Conn.—The contract for constructing a sewer in Hallock-ave. was awarded to A. Brazos & Sons for $10,682, and J. W. Whitby secured contracts for sewers in four streets for about $5,400.

Butte City, Mont.—The contract for building the Jackson-st. sewer was awarded to E. O. Dugan & Co. for $3,424; Arizona and Front-sts., Karlman & Jennings, $2,190; catchbasins, H. S. Joyner & Co., $1,745.

Altoona, Pa.—(Special.)—Harvey Linton, cy. engr., says contracts for terra cotta pipe sewers, 8 and 10-in., were signed June 19 as follows: 1,279 ft., $705.92, Isaac Bender; 2,466 ft., $1,958.94, Charles B. Clark.

Erie, Pa.—Edward Driscoll was awarded the contract for a 15-in. sewer at $1.65 for 15-in. straight and curved pipes, 40 cts. for 9-in. and 30 cts. for 6-in. pipe. $1.90 for 15-in. Y or T branches and $45 for manholes.

Dayton, O.—Chas. Hoskot was awarded contracts June 22 as follows: Van Cleave-st., $3,550.85; Railroad-st., $3,103.30. John Munger & Co. secured the contract June 14 for building the Seeley ditch sewer extension fr $2,600.

Marion, Ind.—Contracts for a sewerage system were awarded June 7 as follows: Central district storm sewer, Kalamazoo Construction & Supply company, $3,396; sanitary sewer, McCourt &Davidson, $16,008; S. Main storm sewer, Greenville Construction company, $19,720.

WATER-WORKS.

Greensburg, Pa.—Judge McConnell decided June 9, that the injunction granted against council to restrain it from issuing $17,000 bonds for establishing a water works system should remain in force until further orders of the court.

New York City.—The T. A. Gillespie company, who have the contract for laying seven miles of 36-in. water main in the west roadway of the Boulevard, hope to have it completed by July 1. Its estimated cost was $275,000.

Kansas City, Mo.—The water committee of the upper house has agreed that a reduction of water rates 25 per cent. to those not having meters, instead of a 15 per cent. reduction to all water consumers, would be a better plan, and a substitute ordinance is being prepared.

Oshkosh, Wis.—W. G. Maxcy, manager of the Oshkosh Water Works company, has a plan under way to secure a pure supply of water from Green Lake for this city. The estimated cost of getting the water here is $200,000, but it is thought that even with the additional expense the plant can be made to pay well.

Des Moines, Ia.—The city council, the citi transfer will be made July 1, 1900, for $850,000 of 4 per cent. city bonds.

Springfield, Ill.—As an experiment toward avoiding the electrolysis of water pipes by electric currents Major J. W. Southwick, superintendent of water works, has been empowered by the water works committee of the council to make electrical connections with the water pipes running in the vicinity of the power house of the Cosmopolitan Railway company.

Council Bluffs, Ia.—Application was made, June 10, for the appointment of a receiver for the property and franchise of the Council Bluffs City Water Works company. The application was made by the Farmers' Loan and Trust company of New York, who also asked for an injunction restraining the company from selling, assigning or incumbering the property.

Los Angeles, Cal.—The Los Angeles City Water company offered, June 14, to sell its entire plant to the city for $2,000,000, and the same, with the addition of the property of the Crystal Springs Water company, for $3,000,000. The water supply committee reported recommending that the city council offer to buy all the property, including the Crystal Springs plant, for $1,300,000. It is known that the company will refuse to accept this offer, which is $1,700,000 less than the price at which the company agreed to sell. Under the contract arbitration must follow the refusal, and if the company refuses to arbitrate the matter will go to the courts. City Engineer Dockweiler has completed maps showing the area covered by the Big Tejunga proposition, the drainage basin, reservior sites, etc. The water shed covers an area of 134 square miles. There are eight reservior sites.

CONTEMPLATED WORK.

Grand Ledge, Mich.—A storage reservoir will be constructed.

Flagstaff, Ariz.—Plans are being prepared for a gravity water works system.

Minneapolis, Minn.—The purchase of a new pump for the water works is contemplated.

Columbus, Ga.—The installation of two power (water) pumps, and about 30,000 ft. of 8-6-in. mains is proposed.

Baldwin, Ia.—Plans for a water works system have been made by the Iowa Engineering company of Iowa City, Ia.

Kingfisher, Okla.—Plans are being prepared for water works, including wells, pumping plant, etc.

Liveoak, Fla.—Thos. Dowling desires to purchase a 35 h. p. return tubular boiler for the water works.

Opelika, Ala.—The water supply is inadequate and the question of obtaining a larger one is an important one.

St. Joseph, Mo.—(Special.)—G. R. Rackliffe, cy. engr., says plans are being prepared for a water works system.

Hawley, Minn.—This town is agitating the question of putting in a tank and mains for a water works system.

Two Harbors, Minn.—Bids will probably be asked soon for a steam pump and an electric

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for the construction of a standpipe and the completion of the water works system.

Unadilla, Ga.—This city has voted to issue $4,000 8 per cent. bonds for the proposed improvements to the water works.

Marietta, O.—Bonds will soon be sold for the completion of the water works and the construction of an electric light plant.

Warren, Pa.—The question of issuing $50,000 bonds for the proposed municipal water works will be voted on July 12. John Masterson, prest. boro.

Newburg, N. Y.—The construction of a supplemental 20-inch water main in Washington-st. is being considered by the water commissioners. Prest. Sneed.

Crestline, O.—The question of securing a water supply for the Branch Hospital in Lick Run is again being considered by the city hospital trustees.

Fulton, N. Y.—(Special.)—O. C. Breed, cy ongr., says a special election was called for June 28 to vote on raising $115,000 to build a new water works system.

Amery, Wis.—The question of erecting a pumping station and installing a water system for North Twin lake to connect with th present system will be voted on July 1.

Rockingham, N.C.—W. N. Everett, mayor, desires to correspond with manufacturers of pumping machinery and with contractors.

Florence, Colo.—(Special.)—P. T. McGuire says: "We are figuring on a water works system for our town and I would like to correspond with some good reliable consulting engineers."

Newburgh, N. Y.—John D. Van Buren and Everett Garrisons, engineers, submitted their report for a new water supply to the water commissioner, June 13. They estimate the cost at $235,000.

The question of constructing water works is being agitated at the following places: Dayton, Tenn.; Armada, Mich., Danbury, Ia.; Hammond, Minn.; Madison, Ga.; Butler, Ky.

Jersey City, N. J.—The Jersey City Street and Water Board rejected all the pending bids for a permanent water suply, June 23, and will advertise for new bids without delay.

Tucson, Ariz.—A board of water and sewerage commissioners will be appointed to investigate the cost of machinery, location, etc., for the water works and sewerage systems. Chas. T. Connell, cy. clk.

Baltimore, Md.—A resolution was introduced, June 17, authorizing the health committee of the city council to investigate the proposed purification of the city water supply. The council adjourned until Sept. 26.

Montgomery, Ala.—The committee is urged by Mayor Clisby to ask for bids for furnishing 50,640 ft. of 4, 6 and 8-in. cast iron water pipe, 120 gate boxes, 60 hydrants, etc., for the water system. J. T. May, chrmn. com.

Philadelphia, Pa.—The largest single item in the $11,200,000 loan bill for public improvements is $2,700,000, which, it is understood, will be used to start filtration, and $1,000,000 for a reservoir for West Philadelphia.

Great Falls, Mont.—The council has rejected the offer made by the Great Falls Water Works, to sell its plant for $400,000. The investigating committee has recommended the issue of $260,000 for an independent water system.

St. Paul, Minn.—The board of water commissioners contemplates, according to report, acquiring land and deepening the Centerville and Peltier lakes of the Rice Lake extension of the water works system, at an estimated cost of $100,000.

Moline, Ill.—A resolution was adopted, June 20, requesting the board of local improvements to adopt some system of filtering the city's water supply, and authorizing the board to employ an engineer to make plans, specifications, etc., required for such improvement.

The question of issuing bonds for water works construction will be voted on as follows: Ruston, La.; Fred W. Price, mayor, Paw-Paw, Mich.; T. J. Cavanaugh, Augusta, Wis., July 6; Gilmore City, Ia.; Phoenix, Ariz., July 18; Breckenridge, Col., July 25; Augusta, Wis., July 6.

The question of constructing water works has been favorably voted on at the following places: Van Alystine, Tex.; Cass City, Mich.; Coun. C. W. Keller—Keota, Ia.; Blair, Wis.; College Hill, O.; Olin, Ia.; Oxford Junction, O.; Maynard, Minn.

The construction of water works systems is contemplated at the following places: Slocan City, Minn.; Ada, Minn.; Oxford, Mass.; Alden, Ia.; Sebastopol, Cal.; Enderlin, N. D.; Attica, N. Y.; Cloverport, Ky.; F. N. D'Huy, cy. clk.—Central Lake, Mich.; Elmore, Minn.; Nekoosa, Mich.; Osage, Ia.; Greeley, Col.; Cedarvale, Kas.

Clinton, Ia.—(Special.)—A resolution has been passed instructing the city engineer to examine the plant of the Clinton Water Works company and report to the city council what changes are, in his opinion, necessary to give the city first-class fire protection. Charles P. Chase, city engineer, says the city council insists on extensive improvements in the distribution system, and if these are not commenced at once will take steps to terminate the contract, and either grant a franchise to a new company or else build a city plant. As a compromise the water company has proposed to lay several miles of larger mains.

CONTRACTS TO BE LET.

Wynne, Ark.—Bids are asked until July 15 for building water works. Geo. W. Eldridge.

Ogden, Ia.—Bids are asked until July 5 for constructing a water works system. J. H. Noyes, mayor.

Cambridge Springs, Pa.—Bids are asked until July 8 for constructing water works. Geo. L. Wade, clk.

Summit, Miss.—Bids will be received until July 5 for constructing a system of water works. J. B. Holden, mayor.

Boone, Ia.—Sealed proposals will be received until July 6 for two boilers for the water works plant. Jesse L. Hill, cy. clk.

Lamberton, Minn.—Sealed proposals will be received until July 7 for laying 565 ft. of 6-in. water main. J. H. Gebhard, vil. sec.

Morris, Minn.—Sealed bids will be received until July 9 for constructing a water works system. Anton Watzke, prest. com. coun.

Sycamore, O.—Sealed proposals will be received until July 26 for constructing a water and light plant. E. J. Eystine, vil. clk.

Austin, Tex.—Bids are invited for one outside packed plunger pump of 4,000,000 gals. capacity and motor for same. H. C. Patterson, supt. w. w.

Lincoln, Neb.—Bids will be received until July 23 for constructing a complete water

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works system for the Feeble-Minded Institute at Beatrice, Neb. Com'r public lands & bildgs.

Montgomery, Ala.—Bids are asked until July 16 for constructing about 10 miles of cast iron water mains, including gates, hydrants, etc. R. H. Somerville, cy. treas.

Winnipeg, Man.—Bids will be received until Aug. 8 for furnishing cast iron pipe, specials, hydrants, valves, etc., for the proposed water works system. C. J. Brown, cy. clk.

Huntington, Mass.—Sealed proposals will be received until July 9 for furnishing about 481 tons of cast iron water pipe, specials, hydrant valves, etc. Leonard F. Hardy, chrm. water comrs.

Ridgewood, N. J.—Bids will be received until July 27 for furnishing a supply of pure and wholesome water. Bids must be based upon specifications furnished by bidders. H. G. Ward, vil. clk.

Evansville, Ind.—Sealed proposals will be received July 12 (extended from July 1), for constructing engine and boiler houses and a chimney for the water works. Fred Grote, mem. bd. w. w. trus.

Guthrie, Okla. T.—Sealed bids will be received until July 5 for furnishing not less than 500,000 gals. of pure water per day. Bidders to furnish their own plans and specifications. Robert Henderson.

Winnipeg, Man.—Sealed proposals will be received until July 25 for the construction and supply of a system of wells and pumping plant for the supply of 4,000,000 gallons of water daily to the reservoirs of the city. C. J. Brown, cy. clk.

Coolgardie, West Australia.—Bids are asked until Aug. 23 for furnishing 246 miles of 31-in. riveted steel pipe, and 82 miles of from 26 to 28-in. welded steel pipe, for the proposed water works system of this city. Seward, Guthrie & Steele, 40 Wall-st., New York City, American office. C. Y. O'Connor, Engr.-in-chief, Perth, Western Australia.

CONTRACTS AWARDED.

Kendrick, Wash.—H. Orchard of Portland was given the franchise for a system of water works in this city.

Mingo, O.—The contract for constructing the water works has been awarded to John Patton of Pittsburg.

Edwardsville, Ill.—The contract for building water works was awarded to Tuxhorn Bros. of this place.

Bedford, Pa.—The contract for building a reservoir has been awarded to H. P. Malone, Hollidaysburg, Pa., for $12,146.

Juneau, Wis.—The contract for extending the water works system was awarded to D. Ahearn & Son of Fond du Lac for $2,468.

Chicago Junction, O.—The Ohio Pipe Co., Columbus, O., was awarded the contract for cast iron pipe June 9 at $14.70.

New Sharon, Ia.—The contract for constructing a water works system has been awarded to Jackson & Moss of Des Moines for $7,860.

Sharpsville, Pa.—The contract for constructing water works was awarded, June 9, to the Standard Boiler & Bridge Co. of Bellaire, O., for $23,422.

Memphis, Tenn.—A meeting was called June 13 for the purpose of hearing and ratifying the agreement which had been reached with the water company relative to the extension of the mains in South Memphis, over the territory in which new sewers have been recently laid.

Ellis Island, N. Y.—The contract between Jersey City and the U. S. Government for supplying this place with water at $100 per 1,000,000 gals. has been signed by Mayor Hoos.

Flagstaff, Ariz.—The contract for constructing water works has been awarded to the American Asphalt company of Los Angeles, Cal., for $65,000. The pipe will be of asphaltum.

Rome, N. Y.—Bids were received June 10 for an auxiliary steam pumping station at Ridge Mills, as follows: George F. Woolston, New York City, $17,793; Henry R. Worthington, New York City, $14,850; Holly Manufacturing company, Lockport, N. Y., $18,800.

Perth Amboy, N. J.—Bids were received June 20 for a 4,000,000-gal. pump, as follows: Buffalo Steam Pump company, North Tonawanda, N. Y., $16,200; Snow Steam Pump works, Buffalo, N. Y., $13,840; Blake Pump company, $22,500; Laidlaw-Dunn-Gordon company, 401-403 W. Fifty-ninth-st., New York City, $13,000; Barr Pumping Engine company, Gtn. Junction, Philadelphia, Pa., $12,000.

Media, Pa.—The contracts for improving the water works were awarded June 7 as follows: Pumping engine and foundation, tubular boiler, filter and foundation, settling basin, steel stack, heater with piping and accessories, Robt. Wetherill & Co., Chester, Pa., $11,388; pumping station, including stack foundation and pumping well. Isaac N. Flounders, Media, $6,440; wrought iron standpipe, complete, including foundations, Walsh Boiler works, Springfield, Mass., $2,895.

BRIDGES.

Oshkosh, Wis.—The council contemplates building a bridge across Sawyer creek.

Wichita, Kas.—The county committee contemplates building several iron bridges.

Fargo, N. D.—Bids will be received until July 8 for constructing three bridges. Co. audt.

Flint, Mich.—The construction of a new bridge across Flint river has been petitioned for.

Rushford, Minn.—The construction of an iron bridge is contemplated. W. F. Drake, cy. clk.

Hyde Park, N. Y.—The construction of a bridge over Crum Elbow creek is contemplated.

Chillicothe, O.—Bids are asked until July 19 for building a 500-ft. bridge. Co. comrs.

Jefferson, Ia.—The county board has voted to build an iron bridge over Buttrick's creek.

Elkton, Md.—Bids are asked until July 5 for constructing four iron bridges. Co. comrs.

Shreveport, La.—Bids are asked until July 5 for building several bridges. P. Youree, prest.

Providence, R. I.—Estimates have been ordered prepared for a bridge over Woonasquatucket river.

Wauseon, O.—Bids are asked until July 5 for constructing an iron bridge over Ten-Mile creek.

Rahway, N. J.—Plans will be prepared for a new bridge at Bridge-st. Lewis Quien, co. engr.

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Ivesdale, Ill.—An ordinance has been passed to build an iron bridge over East Lake Fork ditch.

Buffalo, N. Y.—A bill has been passed for building a bridge across the Niagara river at Grand Island.

Galena, Ill.—The proposed construction of a bridge at Turtle's mill has been favorably voted on.

Rolfe, Ia.—The construction of two new bridges, 40 ft. long, across Lizard creek is contemplated.

Columbus, Ga.—The question of issuing $150,000 bonds for bridge and sewers will be voted on Aug 19.

Richmond, Va.—Estimates for the construction of four bridges have been presented by the city engineer.

Burlington, Ia.—Petitions have been filed for the construction of six bridges. Chris. Mathes, chrmn. bd. co. supervisors.

Sprague, Wash.—Bids are asked until July 7 for building a bridge over Crab creek. J. W. Gunning, co. clk.

Moscow, Idaho.—Bids are invited until July 12 for constructing the Taylor bridge. Jay Woodworth, co. clk.

Carthage, Miss.—Bids are asked until July 4 for a bridge over Lobutcha creek. J. L. McMillon, clk. bd.

Victoria, B. C.—Plans are being prepared for a bridge 939 ft. long, of the Howe truss pattern. B. P. W.

Roseburg, Ore.—Bids are asked until July 8 for building a bridge over Elk Creek. A. F. Stearns, co. judge.

Louisville, Ky.—The construction of an iron bridge has been recommended by the Jefferson county board.

Decatur, Ill.—The Wrought Iron Bridge company, Canton, O., was awarded the contract for constructing a bridge.

Blue Earth City, Minn.—A petition has been presented to the county board for a new bridge across Rice creek in Delavan.

Maryville, Mo.—Bids will be received until July 6 for the construction of 29 bridges. Jas. K. Young, brige comr.

South Bend, Ind.—The county commissioners have been petitioned to build a new iron or stone bridge at Jefferson-st.

Springfield, Ill.—The construction of three bridges at a total cost of $3,700 is contemplated. John H. Pipe, co. clk.

Norwalk, O.—Bids are asked until July 16 for constructing a bridge on the Gates road, Greenfield twp. A. Sheldon, co. aud.

Rockville, Ind.—Bids will be received until July 8 for repairing the abutments to the Bridgeton bridge. E. H. Owen, co. audt.

New York City.—A new steel bridge over Newton creek, at Blissville, has been authorized by the board of estimate and apportionment.

Rushville, Ind.—Bids will be received until July 6 for constructing three bridges north of Falmouth, Ind. E. L. Kennedy.

Chillicothe, O.—Bids will be received until July 19 for building an 80-ft. bridge over Deer creek on the Westfall road. Co. Audt. Adams.

Gettysburg, Pa.—Bids are asked until July 13 for building a high truss iron bridge over Conowago creek, in Butler twp. Henry Hantz, co. comr.

Mondovi, Wis.—The bridge across Fisher's pond, which has been condemned, will be replaced with either a stone or iron bridge.

Mason City, Ia.—Press reports state that bids received for one 75-ft. and one 100-ft. steel bridge, have been rejected.

Richmond, Ind.—Bids will be received, July 2, for building a new stone bridge 4 miles west of Richmond. S. L. Bay, co. bridge com.

Tacoma, Wash.—Plans and specifications for the Elbe bridge are completed and bids will be asked soon. W. D. C. Spike, co. audt.

Carlisle, Pa.—The Wrought Iron Bridge company, Canton, O., has been awarded the contract for building a bridge at Bishop's fordway for $3,400.

Changewater, N. J.—The county commissions have voted to construct an iron bridge over Musconetcong creek at an estimated cost of $7,000.

Wausau, Wis.—The town of Easton has asked the county board for aid in constructing a bridge across the Eau Claire river. Estimated cost, $3,000.

Breckenridge, Minn.—Sealed bids will be received until July 11 for the construction of a bridge across Otter Tail river. Z. T. Sheperd, co. audt.

Mt. Vernon, O.—Bids are asked until July 6 for building the iron superstructures of two bridges over the Kokosing river. W. A. Wander, co. audt.

New Rockford, N. D.—Bids will be received until the July meeting of the county board for rebuilding the Monon bridge. F. S. Funham, co. audt.

Grafton, N. D.—Bids will be received until July 6 for constructing iron, combination and pile bridges during the year. O. M. Fraser, co. audt.

Birmingham, Ala.—Sealed proposals will be received until July 18 for constructing an iron bridge across Valley creek, near Brighton. Co. comrs.

New Orleans, La.—The residents of the Seventh ward have petitioned for the construction of a bridge over the St. Bernard-ave. canal at Prieur-st.

Salem, S. D.—Bids will be received until July 9 for constructing a bridge in sec. 35 and two truss bridges, 36 ft. long. J. C. Headlee, co. audt.

Decatur, Ill.—The Wrought Iron Bridge company, Canton, O., has been awarded the contract for building a bridge over Stevens

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twp. and a 170-ft. bridge in Harrison twp. and a bridge in Clinton twp.

Brookings, S. D.—Bids will be received until July 13 for constructing a steel or combination bridge across the Sioux river, in Medary twp. J. T. Nelson, co. audt.

Assumption, Ill.—Press reports state that five small steel highway bridges will be built soon in Assumption twp. Charles A. Clark, H. H. Tripp and Mike Kirby, comrs.

San Jose, Cal.—Press reports say that County Supervisor Roll has been authorized to prepare plans for a steel bridge over Los Gatos creek, on Campbell-ave.

Rochester, N. Y.,—Bids are asked until July 5 for constructing a lift bridge over the Erie canal at Fitzhugh-st. Geo. W. Aldridge, supt. Pub. Wks., Albany.

Freeport, Ill.—The Wrought Iron Bridge company, Canton, O., secured the contract for building three bridges and repairing an old one in Buckeye twp. for $1,600.

St. Joseph, Mo.—Bids will be received July 7 for the construction of three bridges, repairs to a road and building an iron pipe culvert. Theo. Steinacker, co. surveyor.

Hamilton, O.—The bids received recently for building a hoist bridge across the Middletown canal were rejected, and new bids will be received July 15. Co. comrs.

Forman, N. D.—Bids, accompanied by plans and specifiactions, will be received until July 8 for constructing two bridges over Wild Rice creek. A. N. Carlblom, co. audt.

Santa Rosa, Cal.—Sealed bids will be received July 7 for constructing a bridge over Russian river, at Wall's Ford, in Redwood and Forestville districts. Somers B. Fulton, co. clk.

Bound Brook, N. J.—The freeholders of Somerset and Middlesex counties are reported as having decided upon the construction of a bridge over Green Brook, at Union-ave.

Cincinnati, O.—Sealed proposals will be received until July 15 for the construction of a wrought iron truss bridge over Taylor's creek, Miami twp. E. L. Lewis, co. audt.

South Bend, Ind.—A petition has been presented to the board of commissioners requesting the removal of the iron bridge across the St. Joseph river at Jefferson-st., and the erection of a new one.

Brooklyn, N. Y.—John L. Shea, bridge commissioner, has asked for an appropriation of $700,000 to build a new bridge over Newtown creek, from Manhattan-ave., Brooklyn, to Vernon-ave., Queens borough.

Denver, Col.—The residents in South and West Denver are anxious that the bridge now in line of the Fourteenth-st. viaduct, over the Platte river, be moved to the intersection of S. Fourteenth-st with Cherry creek.

Chicago, Ill.—Sealed proposals will be received until July 20 for supplying and erecting six bridge substructures and five superstructures along the line of the main drainage channel. Jas. Redding, clk. bd. drainage trustees.

Spokane, Wash.—Sealed bids will be received until July 5 for the construction of about 500 ft. of steel bridge and about 50 ft. of wooden trestle approach for carrying a water main across the Spokane river. B. H. Fowle, secy. B. P. W.

Jackson, Miss.—(Special.)—Walter G. Kirkpatrick, cy. engr., says plans are nearly ready for a steel bridge, 100 ft. wide and 86 ft. span, with buckled plate floors; for removing the present bridge (iron); for masonry abutments, and for alternate bids for an arch bridge of brick or Melan concrete.

Judge Garrison of the New York supreme court rendered a decision June 16, declaring that the removal of the former East river bridge commission and the appointment of the present commission by Mayor Van Wyck were illegal. The commissioners had recently secured an appropriation of $2,000,000 and were ready to advertise for proposals for constructing the towers and end spans, but the decision will prevent the making of further contracts.

PARKS.

Montpelier, Vt.—Plans have been prepared for a park. Joel Foster, cy. engr.

Santa Rosa, Cal.—Freeholder Ross advocates the establishment of a public park for this city.

Los Angeles, Cal.—The question of issuing $10,000 bonds for park purposes will be voted on July 5.

San Francisco, Cal.—The park commissioners are reported as having under consideration a plan for the improvement of Golden Gate park; estimated cost, $349,200.

Indianapolis, Ind.—The establishment of a park in the East End is proposed. The location of the park will be on E. Washington-st., and will lie between Washington, Randolph and Ohio-sts. and Johnson-ave. The plans for the White river park are about completed.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Westchester, Pa.—The question of purchasing an incinerator is being agitated.

Punxsatawney, Pa.—The question of erecting a garbage crematory is under consideration.

Lancaster, Va.—The purchase of a disposal plant, at about $8,000, has been prepared by Councilman Miller.

Columbus, O.—The sum of $20,000 has been authorized, according to press reports, for street cleaning.

Kenosha, Wis.—The contract for sprinkling Prairie-ave., was awarded, June 6, to J. H. O'Brien, at 12 cts. per lin. ft.

Hartford, Conn.—The contract for removing ashes, at $10,000 and garbage at $9,850 a year, was awarded to the Edward Balf company, June 1.

Almeda, Cal.—The council is considering the question of accepting a proposition from a company for a garbage disposal plant for this city.

Union Hill, N. J.—The contract for removing the garbage has been awarded, according to report, to Peter Brady, at $2,100 a year.

Hoboken, N. J.—A bid to remove the ashes and garbage of this city at $3,600 a year, has been submitted by Paul Breslau of Jersey City, N. J.

Plainfield, N. J.—A plan is being considered by which the city may acquire possession of the garbage plant of the Plainfield Sanitary company.

(Continued on page 29.)

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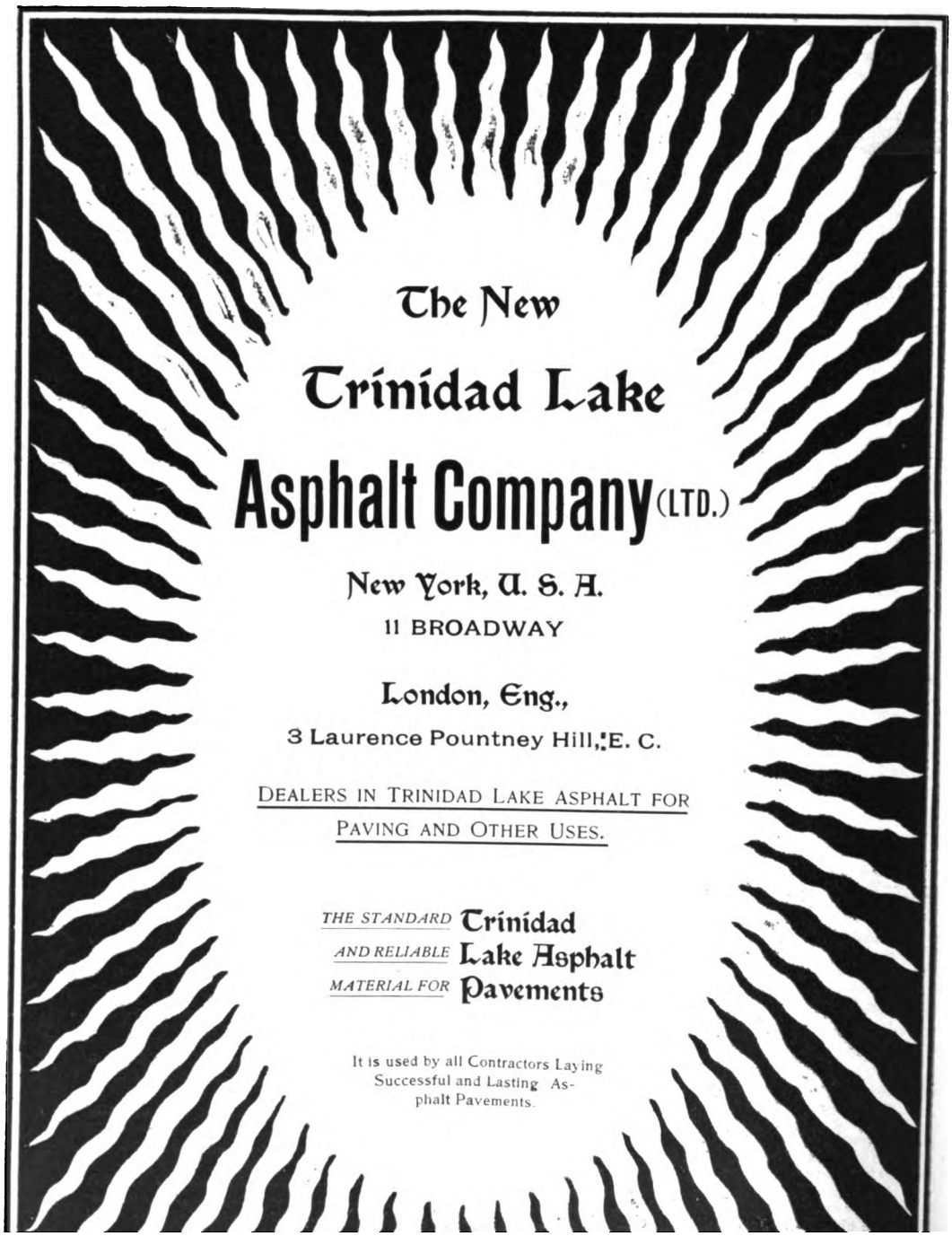
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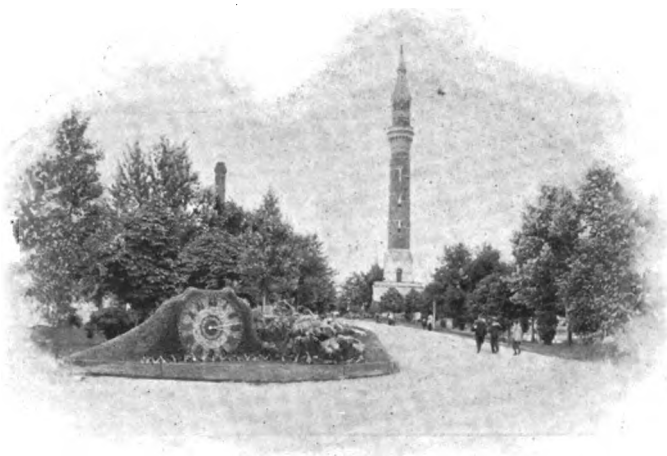
Municipal Engineering

VOLUME XV. AUGUST, EIGHTEEN NINETY-EIGHT. NUMBER 2.

DETROIT: AN INTERESTING CITY.

A list of a dozen of the most attractive American cities would, in the judgment of the writer, include Detroit. There are many things that make it attractive, and it is especially pleasing during the summer months. Its location is fortunate commercially, and altogether advantageous in providing pleasurable facilities. It owes most of its commerce and much of its pleasures to the beautiful river which brings it into touch with the chain of great lakes, with Erie spreading out to the east and St. Clair and Huron on the north. It is interesting, too, as the great American gateway to Canada, where one sees much of amiable association of the British flag and American stars and stripes as well as amicable mingling of subjects of the two great countries. A stranger's first impressions from casual observations about the city are apt to be favorable. It has a substantial and prosperous appearance, and there are well marked evidences of progressive spirit in the community, but some also of rather amazing conservatism, with a little here and there that seems to be a relic of dogged and incredibly benighted old-fogyism.



VIEW OF DRIVE AND STAND PIPE IN WATER-WORKS PARK, DETROIT.

In its general aspects there is much that suggests New York, a little of Philadelphia, a touch of Boston and something of Chicago.

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The passing throng in the business streets indicates that the people are moderately busy, that they understand themselves and have no pressing anxieties, and have implicit faith that in the course of human events all that needs to be done will be done. They evidently look upon life as not altogether a matter of business. They appreciate

THE CITY HALL, FROM WOODWARD AVE.

their homes, there is a good deal of social mingling, and they like their parks. The ruling passion seems to be a desire to ride something. All Detroit is in a mad whirl of vehicular locomotion when the weather is favorable. There are probably less than a million bicycles in Detroit, but as an offhand guess after a few minutes of observation on the principal thoroughfares it would be just as satisfactory to "let it go at that." Those who aren't out on wheels or behind teams, go on the street cars or steamboats. When they go on the steamboats most of them take their wheels along. Riding is cheap in Detroit. For a dime one can float around between Detroit, Windsor and Belle Isle until weary of water travel. For a nickel one can travel a dozen miles or more across and around Detroit in the fastest moving street cars in the world.

The general appearance of Detroit is as wholesome as it is pleasing. Its physical condition is good. Its principal streets are paved with asphalt and brick, and the work, with a few exceptions, has been well done. The street-cleaning methods of Col. Waring are closely followed. The asphalt

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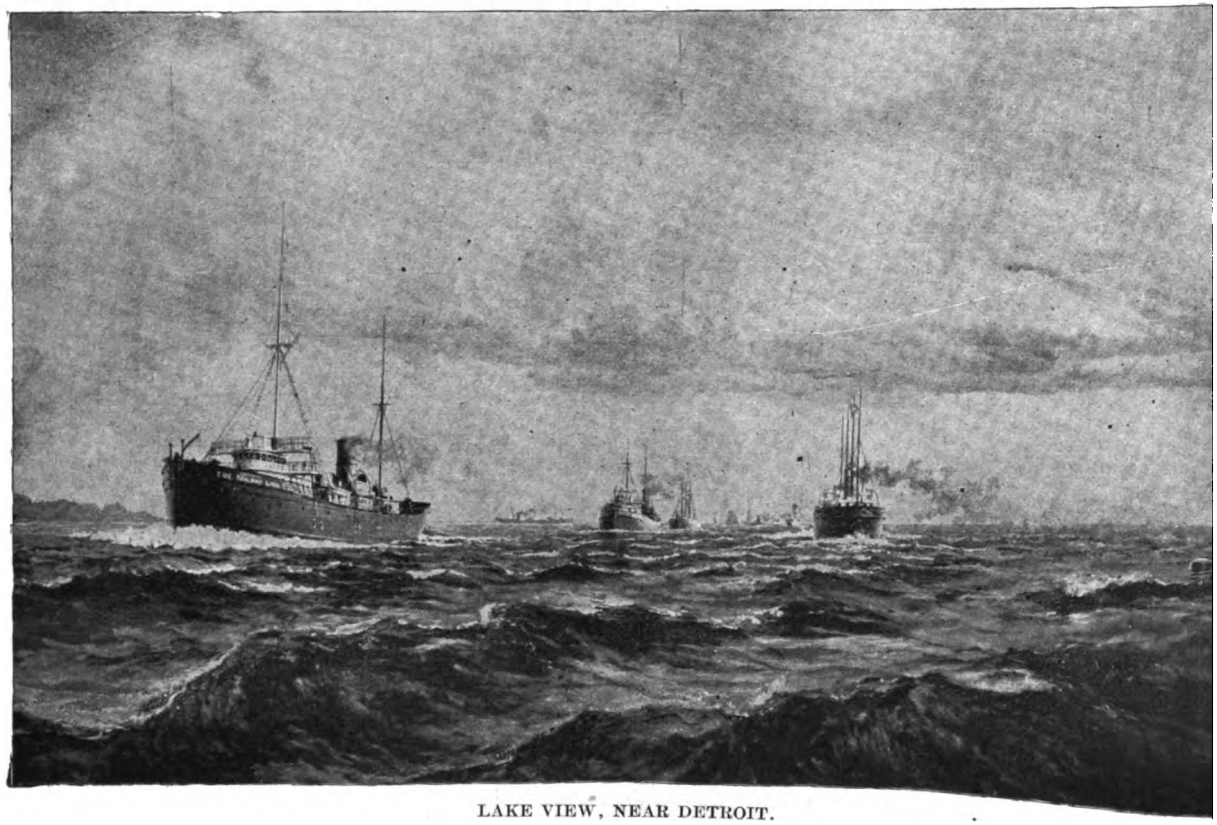

LAKE VIEW, NEAR DETROIT.

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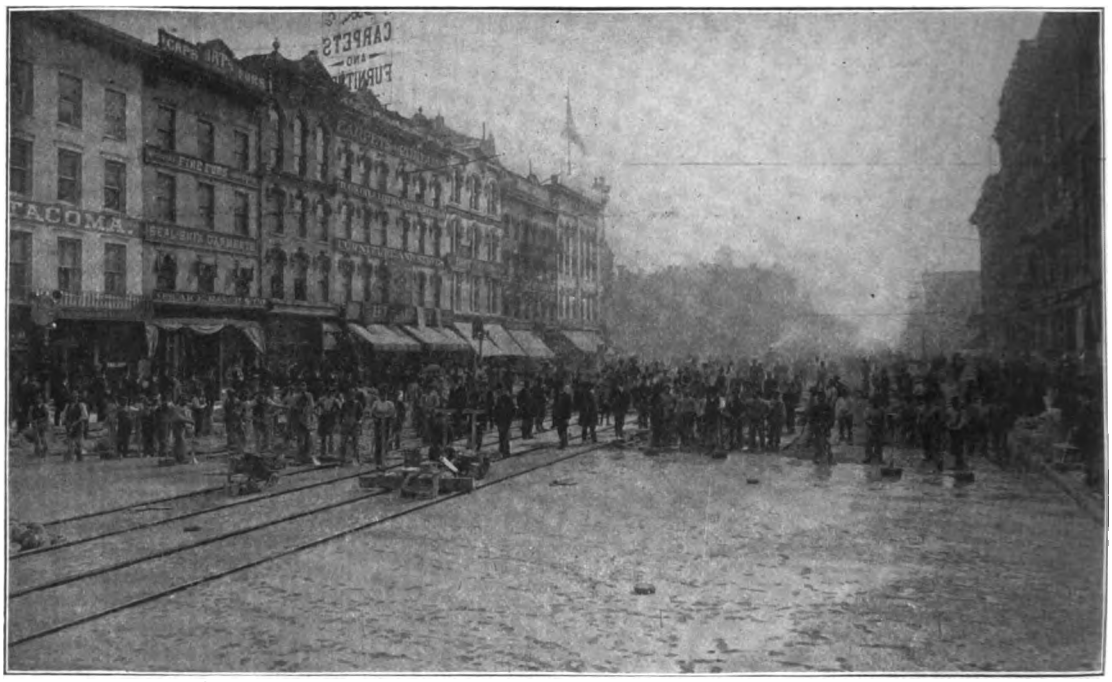
and brick paved streets are kept pretty clean. In organizing the force for this work Commissioner Moreland determined to employ only industrious workers. He announced that no man would be given employment on account of political considerations. His street cleaners are mostly Italians accustomed to hard labor. They are under strict discipline, are not allowed to idle during working hours, and are required to keep themselves, as well as the streets,

There has been much opposition to the continued use of this material, and Mayor Pingree was particularly hostile to it during his adminstration, but with the aid of strong local influences it seems to remain in favor in Detroit as a cheap form of paving.

Detroit is an interesting instance of municipal ownership of both its water and electric light services.



LAYING A CONCRETE FOUNDATION ON WOODWARD AVE.

It still uses the tower system of street lighting. During the fiscal year ending in June, 1897, the

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THE MAJESTIC, ONE OF THE PRINCIPAL OFFICE BUILDINGS.

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each, the total cost of which was 34 cents per hour, including interest, taxes and depreciation.

At a meeting of the public lighting commission on July 12th, 1898, Secretary Starring reported that the average cost of the arc lamps during the last year had been $51.85 against $64.19 for the preceding year, showing a reduction in the cost of $12.34. Of this wages take $33.27 and stores $18.58. Expenses for twelve months included: operating, $99,713.18; construction, $60,923; inspection, $2,825.97;

A BREATHING PLACE IN THE BUSINESS CENTER.

$7,000,000. The bonded indebtedness amounts to $1,183,000. The supply is pumped direct from the Detroit river by pumps with a capacity of 96,000,000 gallons. The system comprises 501 miles of mains with 48,915 taps, which are made by the city at $1.75 for ⅝-in. and $3 for 1-in. There are over 4,000 meters in use. They are owned, controlled and repaired by the city, and no rental charge is made for them. The city can compel the use of meters and customers may have them on demand. The

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THE DETROIT CHAMBER OF COMMERCE.

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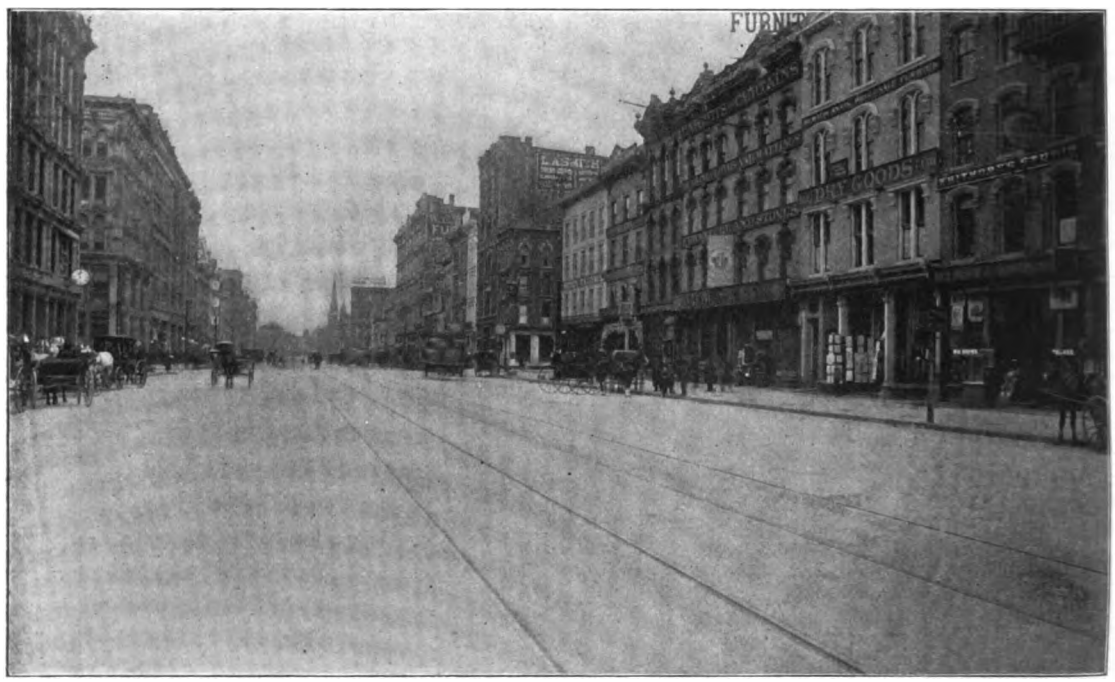
if the works were under private ownership. The average daily consumption of water is 40,000,000 gallons, which indicates a large waste by consumers. The works present one of the best examples of municipal ownership. Mr. L. N. Case has been the manager for many years, and is regarded as one of the most capable water-works men in the country. There has recently been much agitation in Detroit in favor of free water for baths, and an interesting paper on this subject, read by Mr. Case before the American Water Works Association, appeared in the July number of MUNICIPAL ENGINEERING.

The entire system is operated by electricity and the cars are run at a high rate of speed. An effort was once made to compel the company to run at a slow rate, but after a short and very unsatisfactory experience the enforcement of the rule was abandoned. It is the theory of the manager of the Detroit street railway lines, Mr. A. B. duPont, who is one of the most capable men in the local transportation business in America, that rapid transit is essential in facilitating city life in all its relations, and the duty of the company is to serve the passenger on the car rather than to look out for people on the street, who should look out



A VIEW OF WOODWARD AVE., PAVED WITH ASPHALT.

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trained up to careful recognition of this rule. Drivers on cross streets look out for approaching cars before attempting to cross street railway tracks, and pedestrians have learned that upon them rests responsibility for the same vigilance. People who wish to take the cars must be in readiness at the right place for stopping. Required observance of these rules enables the street railway company to move its cars with the least possible delay and to give its passengers quick service. It affords considerable advantages both to the public and the transportation company. It permits almost unlimited expansion of the city, a healthful and comfortable distribution of population, a quick transit from homes to business several miles apart in location, and, on the part of the company, increases its earning power to the maximum

ASPHALT PAVEMENT ON CADILLAC SQUARE.

been made along the lines of the best service that can be profitably provided. The three-cent fare was tried for a time and was abandoned. Eight trips for a quarter and six trips for a quarter, including transfers, have been tried. A study has also been made of the maximum mileage that can be allowed for a single fare. These questions have been vigorously pressed for consideration in Detroit by the agitation so persistently kept up by citizens under the leadership of Pingree, who endeavored as mayor to force the concession of a three-cent fare, and succeeded for a brief time. The street railway company claims to be interested equally with the public in having the lowest rate of fare that it will be justified in charging. The knowledge acquired by the managers of the Detroit company

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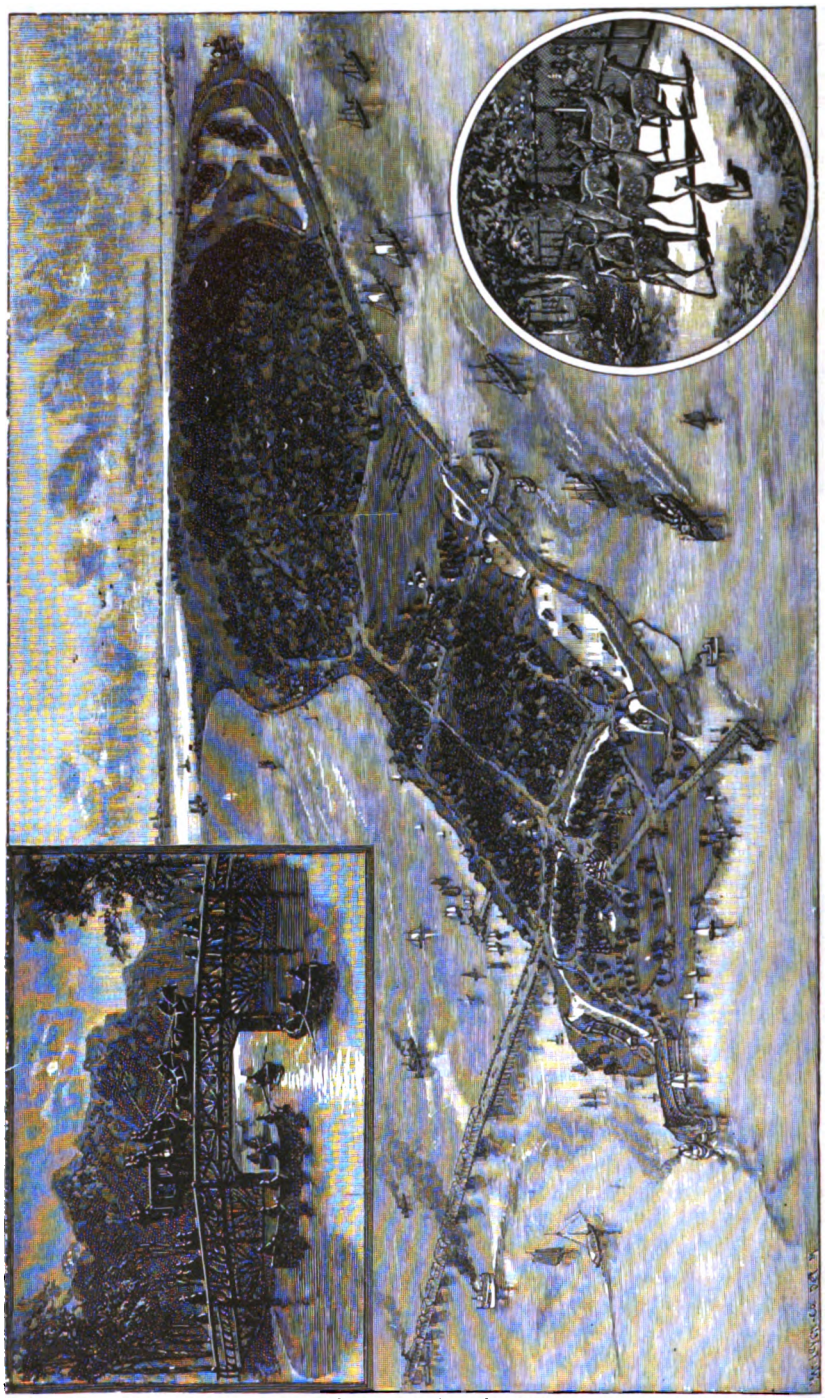

BIRD'S-EYE VIEW OF BELLE ISLE PARK, DETROIT.

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vinces them that the rate should be in any community that which will produce the largest gross revenue. This, it is asserted, is a fair test of the popularity of the rate and gives to the company the best capacity for service. While not ready to state what is exactly the correct rate to be charged in Detroit the managers of the company say that will produce the largest gross revenue, as the best solution of the street railway problem in the granting of a franchise by a municipality.

Nature has done much to make Detroit an attractive city, and the people have been generous in helping Nature. The residence streets are adorned with fine trees, well kept lawns and enough of flowers to give

ON THE CANAL, BELLE ISLE.

enough is known to warrant the conclusion that it is not three cents, nor is it five, but it is somewhere near four, where the transfer privilege is included.

The Detroit company pays for street paving between and along its

them a park-like appearance. The happy influences of such surroundings mean much in the making of a city. They impart to the people better quality than is found where such things are locking. Detroit is proud of her parks, and well she

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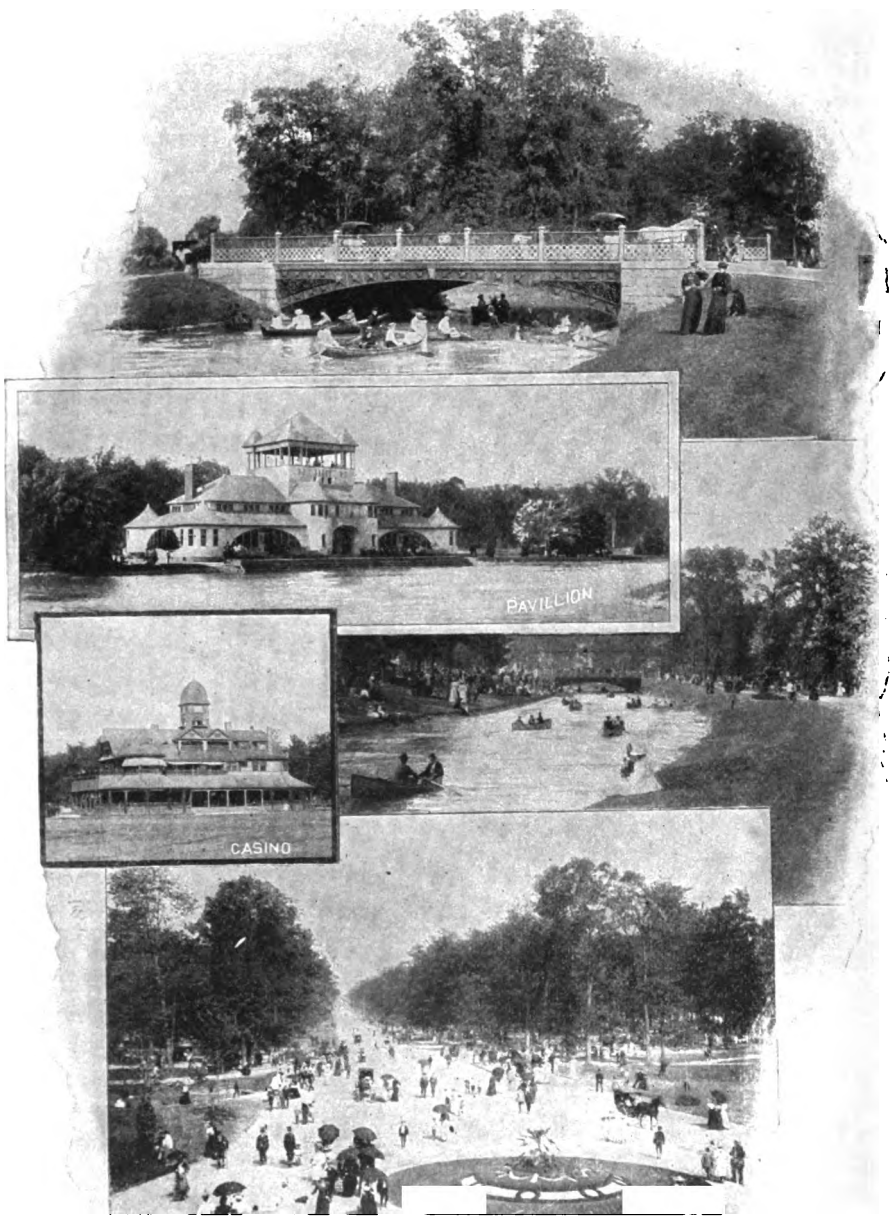

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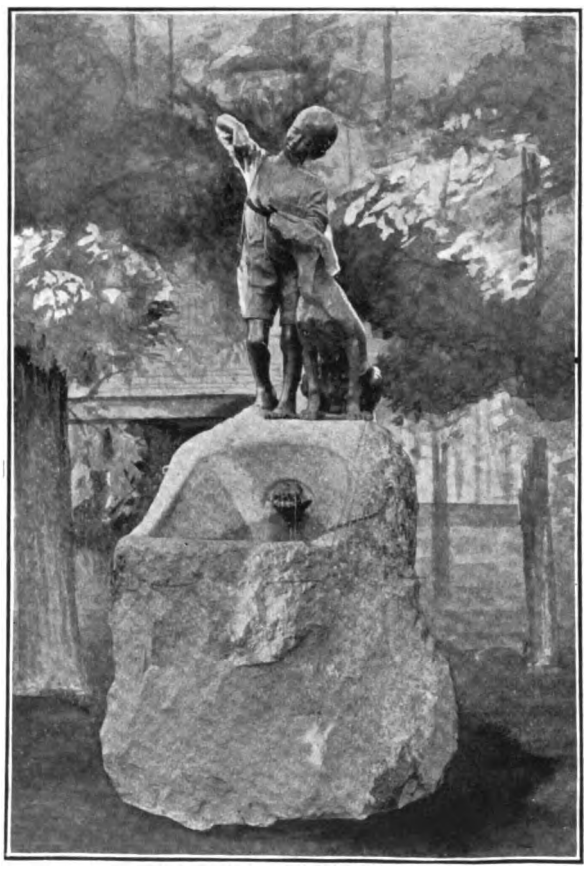
well as by the crowds which may always be found in them. They are visited, according to a local estimate, by a hundred thousand people on any favorable summer day. The most notable—"the jewel of them all," as it is called—is Belle Isle, an ideal spot around which

named it Isle St. Clair, the Indian name for the lake being Otsiketa. In early days the island was infested with rattlesnakes, and partly to destroy them, and partly as a matter of convenience, the English commissary department placed a drove of hogs on



NEWSBOYS' FOUNTAIN, BELLE ISLE.

flows the Detroit river. A local writer gives some information about it, with some justifiable enthusiasm

the island, and they became so numerous that the French designated the island as Isle au Cochow,

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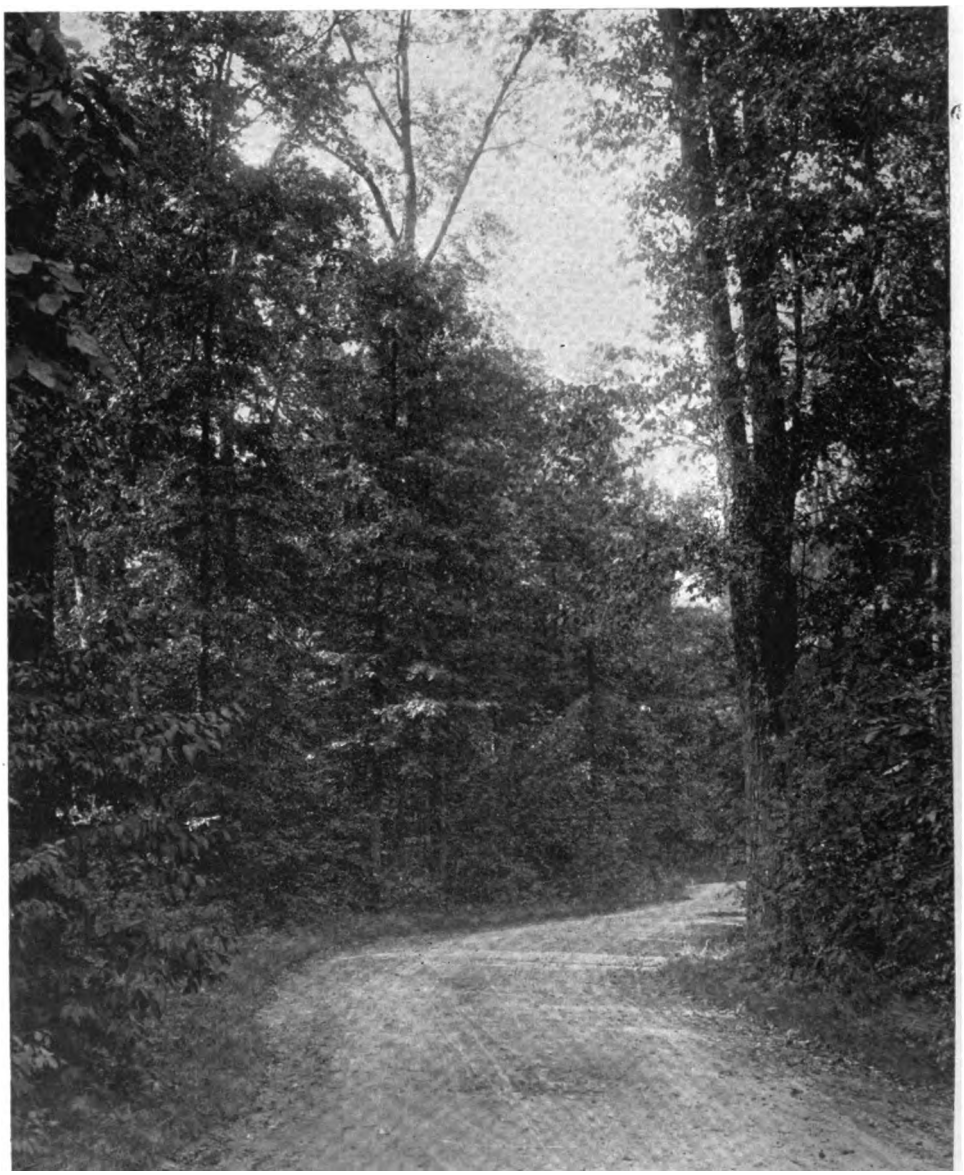

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appendage to the fort at Detroit, and during the American revolution rebel prisoners were here employed in cutting wood. Portions of the island were cultivated prior to the Pontiac conspiracy, and during that conspiracy, on May 9, 1763, the Indians massacred the family of James Fisher, then living on the island. The earliest individual title of the island dates from 1789, when Lieutenant McDougall bought it of the Chippewa and Ottawa Indians for eight barrels of rum, three rolls of tobacco, six pounds of vermilion, and a belt of wampum, its value being estimated at $1,000. It was sold from the date of its first sale, it was sold by the heirs of Campau to the city of Detroit for $200,000, or two hundred times its first estimated value. The purchase of the island as a park was first suggested, and was successfully negotiated, by Levi L. Barbour, and he richly deserves the thanks of all who enjoy its beauties. Fortunately, Detroit has had park commissioners, who, by their thoughtfulness, have greatly increased the original attractions of the park. The first improvements were made under the direction of the noted landscape artist, Frederick Law Olmstead, and up to 1895 there has been

LOG CABIN IN PALMER PARK.

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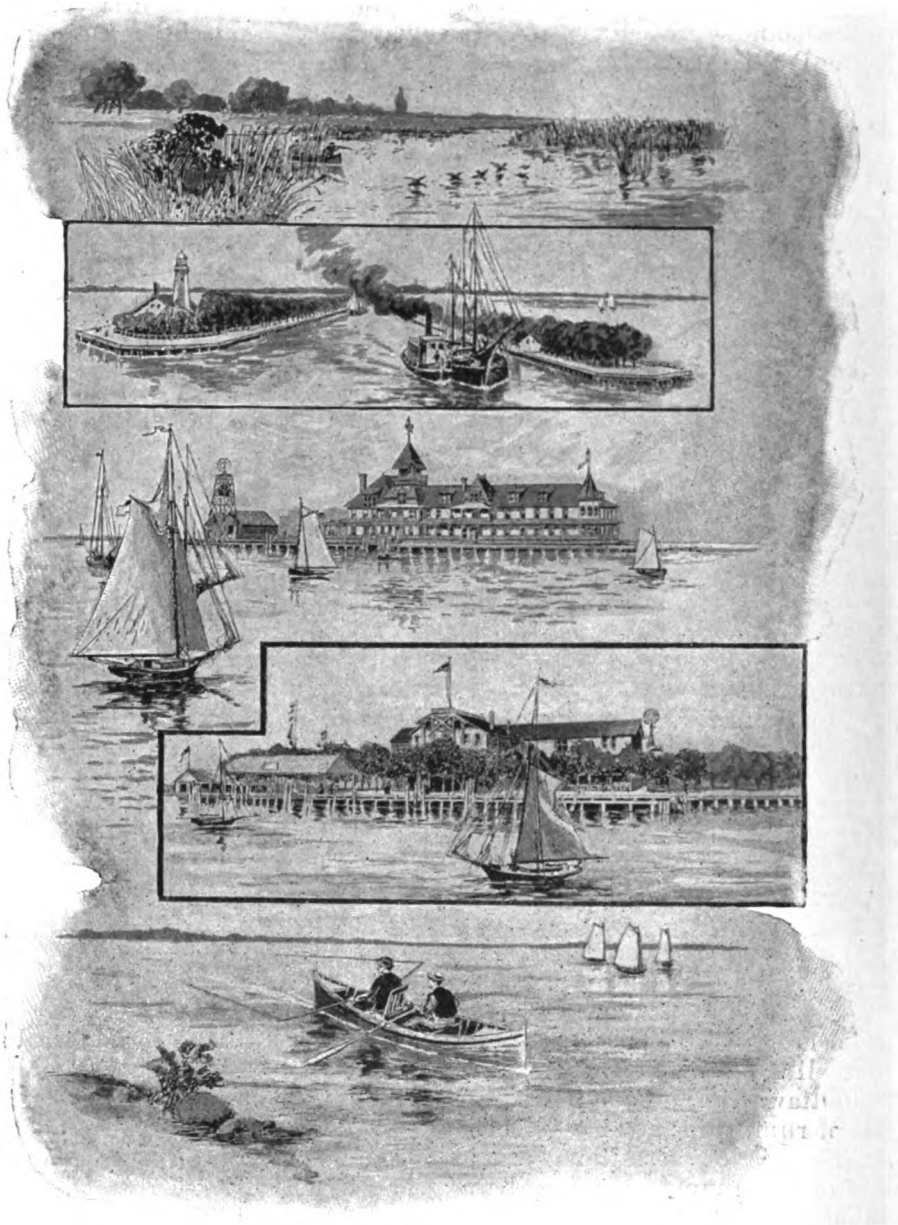

VIEWS OF ST. CLAIR FLATS.

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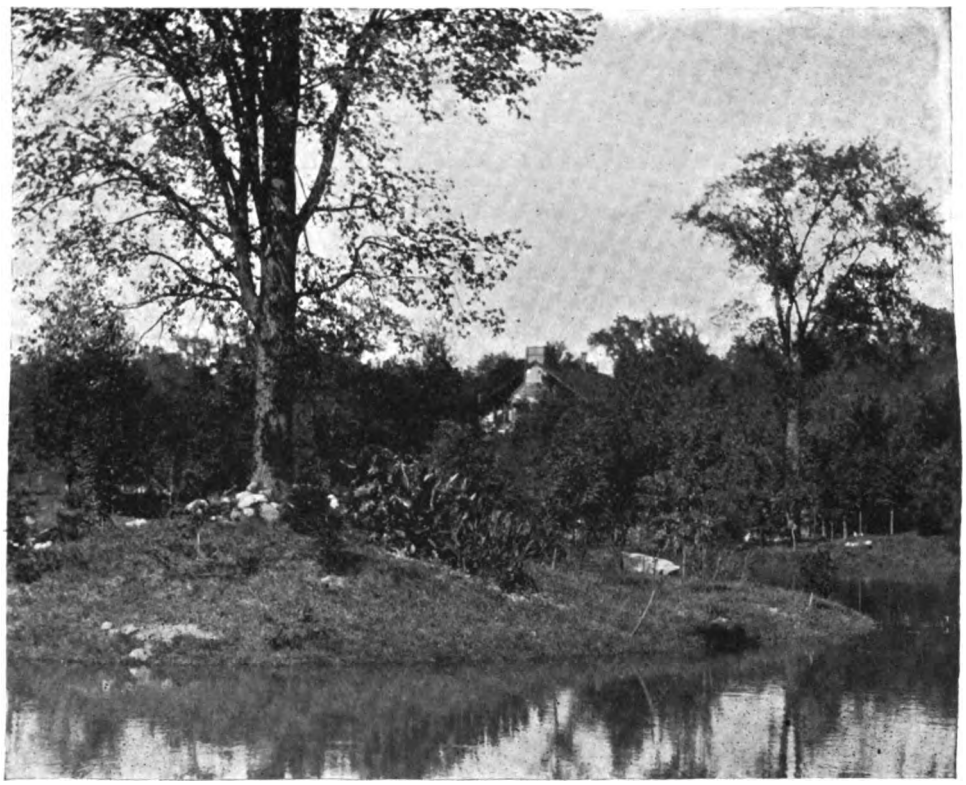
"The island is indeed the priceless jewel in the crown of Detroit. Woods of green and waters of blue —art and nature—moving waves and waving grass—stillness and activity—vistas and broad views—beautiful flowers and lofty trees—the white sails of numerous vessels and the swift motion of great greatest artist. The electric lights of the evening bring fancies of a fairy land, so weird and full of witchery do all things seem.

"There is water everywhere; you are surrounded by a sea of silver bordered with blue; there is water for drinking, bathing, rowing, sailing and wading, all free,



A BIT OF KNOLL AND A LITTLE WATER.

steamers, all alike are combined in the captivating beauties of this favored place. You can walk or drive in deep solitude, or amid the pure, clean, rippling and beautiful. The bath houses contain scores of bath rooms, with hundreds of bathing suits for both men and women.

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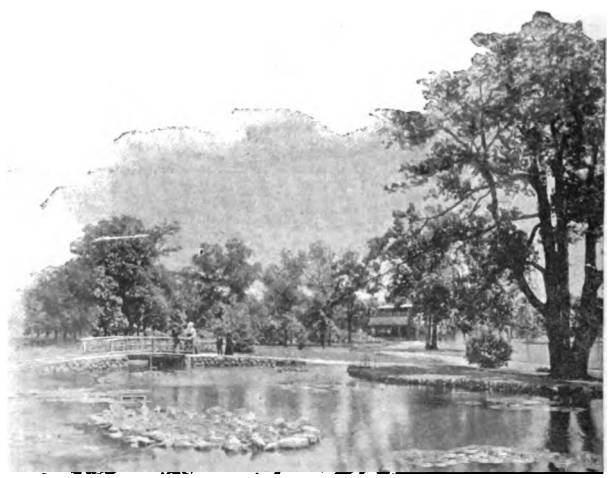
WATER-WORKS PARK.

boats to let. In the winter time, the pavilion lake is free from snow, for the use of skaters, and is used by thousands.

"The park is reached by way of the bridge, at junction of Jefferson avenue with the boulevard, or by ferry boats, which in summer make several trips every hour, the principal point of departure being from the foot of Woodward avenue. Among the attractive features are the deer, elk and fox enclosures and the menagerie. There are a number of elk, several score of deer, and quite a variety of birds and animals. Squirrels are numerous all over the island; they peer at you from almost every tree, run here and there before you, and in the summer time are almost as plentiful and playful as the pic-



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nickers, and get many a meal from their supplies."

Next in size to Belle Isle, and covering an area of 132 acres, is Palmer park, the gift of Hon. Thomas W. Palmer. A famous log cabin is located here, and contains many relics of bygone centuries. Although the work of improvement has but recently been undertaken, Palmer park, with the large colonial casino, music pavilion, lakes, roads and walks, is a most romantic place. There are other smaller parks, including Cadillac, opposite the city hall, three acres; Capital Square, surrounded by State street, Grand River avenue, Rowland and Griswold streets, two and one-half acres; Cass park, five acres; Clark park, twenty-four acres; Grand Circus park, five and one-half acres, and Water Works park, six miles east of the city hall, forty-seven acres.

There are many points of interest within easy reach of the city. Among these is Grosse Point, the summer home of Detroit's swell people; Grosse Ile, a few miles down the Detroit river; Walpole Island, used by the Canadian government as an Indian reservation; Mt. Clemens, famous as a health resort, an hour's ride by electric railway, and St. Clair Flats, sometimes called the little Venice of the Western Hemisphere, thirty miles distant.

The many interesting and attractive features of Detroit and its central geographical location make it a favorite point for assemblages, and with the purpose of making the most of its opportunities in this way an organization of business men has been formed, known as the Detroit Convention and Business men's League, which claims for Detroit distinction as "The Convention City" and devotes itself to bringing there all meetings that can be tempted by the attractions and facilities offered to visitors. It has been unusually successful in its work. The president of the organization is Mr. J. C. Hutchins, and the details of the executive work are most efficiently looked after by the secretary, Mr. D. A. Bruce. The annual meeting of the American Society of Civil Engineers has just been held there, and during the first week of August the League of American Municipalities, composed of mayors and councilmen from different cities, will hold its annual meeting in Detroit. The arrangements for the latter have been under the charge of a local committee, composed of municipal officers, with Mayor W. C. Maybury as chairman. The program for the meeting, so far as arranged, embraces general discussions, open to all delegates who wish to participate, as follows:

Municipal Ownership of Public Service Industries—What progress has been made in this line in the United States and Canada and with what results? What should be its limitations?

Remuneration to Cities for Franchise Rights In, Over and Under Public Streets and Alleys—What remuneration, if any, should be exacted from light, water, street railway, telephone and subway corporations, and how should it be collected?

The Civil Service—What results have been attained by requiring applicants for positions in city departments to pass an examination and making their tenure of office dependent on good behavior and mental and physical ability? To what departments should civil service laws apply?

Garbage Disposal—What has been the experience of municipalities in attempting to collect and dispose of garbage in a sanitary and economical manner? Are the present utilization and incineration inventions satisfactory and what does it cost to operate them?

Public Water Supplies—What means should a municipality employ to supply its people with an ample supply of pure water at equitable rates? Is the general use of meters desirable? What systems of filtration are satisfactory?

Boards, Single-Headed Commissions or Council Committees—Should the administrative affairs of the departments of public works, water, fire, police, parks, charities

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and correction be conducted by boards, single-headed commissions or council committees?

Street Paving—What are the relative merits and cost of the various paving materials?

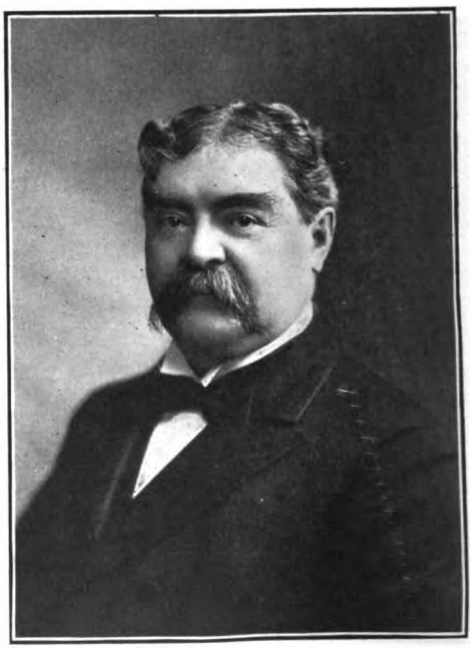
Regulation of Saloons—What policy is best to use in enforcing the laws pertaining to saloons?

The membership of this organization is composed of mayors and representatives of the legislative branches of municipalities. The sessions of this convention will be held in the Light Guard Armory, one of the buildings of which Detroit's citizens are proud.

H. S. PINGREE, DETROIT,
Former Mayor—Now Governor of Michigan.

Detroit's most interesting figure, especially to municipal officers, is the city's former mayor, Hazen S. Pingree, now Governor of Michigan. His fame, however, rests chiefly on his performances as mayor, and he was certainly a remarkable mayor. He filled the office as picturesquely in Detroit, as did the late Carter Harrison in Chicago. He is both the most hated and the most popular man in Michigan. As mayor he filled, and proved himself a progressive man of broad mind and great ability. He made mistakes and many of them, but, as a champion of the people, his public position in Detroit is that of an idol of the masses.

He was elected mayor of Detroit four times, each time by an increased majority, reaching 10,592 at his last election in 1895. In 1896, while still mayor of Detroit, he was elected governor of Michigan, and he endeavored to hold both offices. He could see nothing questionable or inconsistent in his doing this, and is quoted as saying, "I can do it and the people want me or they wouldn't have



W. C. MAYBURY,
Mayor of Detroit.

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I don't know why I shouldn't be president of the United States and governor of Michigan and mayor of Detroit all at the same time if it is the wish of the people and I'm willing." He actually served as both governor and mayor for a time until, as a result of proceedings instituted by Commissioner of Public Works Moreland, he was compelled by the courts to relinquish the office of mayor. His successor, W. C. Maybury, is of opposite politics, and was elected by as large a majority as Pingree had received. Mayor Maybury is also popular in Detroit. He has served in congress, and has held other public offices. He is gifted as an orator, and it is said that, in complying with the demands which are made upon him, he will easily average a public speech for every day in the year.

MINOR REPAIRS TO ASPHALT PAVEMENTS.

By F. E. Puffer, A. B.

The object of this article is to show how minor repairs to asphalt pavements may be made in an economical and substantial manner without the use of a large asphalt plant such as is used in making the original paving mixture.

The apparatus and tools required and cost of same is substantially as follows:

2 rakes @ 75c	$ 1 50
4 tampers @ $1.00	4 00
2 smoothers @ $1.50	3 00
Miscellaneous tools, shovels, picks, etc.	25 00
1 fire wagon	100 00
1 stone or iron roller	50 00
1 pitch kettle	100 00
2,000 brick in place	80 00
2 pieces sheet steel	15 00
Total	$328 50

In a vacant lot or city yard, as near the pavement to be repaired as possible, there should be built a little furnace or heater about six feet by nine, consisting of a piece of boiler iron stiffened by a few pieces of T iron; this iron should rest lengthwise on three brick walls forming two flues leading into a chimney or stack at the back. The side of the furnace should be a platform about five feet square, to be used for mixing purposes. This platform should be of steel suitably supported by brick. The pitch kettle should be set near the platform.

The method of operating is as follows: Heat sand on a large platform by wood fire in flues underneath to required temperature—say about 325° F. Measure out onto mixing platform by means of a cubic foot box measure provided with suitable handles, say, four cubic feet of sand. Add to sand and mix by means of shovels ten to fifteen pounds of pulverized lime stone for each cubic foot of sand. When the sand and limestone have been mixed add to the mass from the pitch kettle in which asphalt cement has been previously heated about fifteen pounds of asphalt cement for each cubic foot of sand. The mixing of asphalt cement and sand can be accomplished—if the mass is not too large—by means of hot shovels, the mass being turned over and manipulated according to the usual practice of mixing con-

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crete. If the mixture used is right (this may require some experimenting and expert knowledge) the mixture can be mixed as uniformly as can be done by machinery.

When enough material has been accumulated by successive mixtures and put into a cart it should be taken to the street and laid in the usual manner.

Mixing should never be attempted on the furnace. The material should be mixed on a platform with no fire under it, although it is well to warm the mixing platform before mixing.

Old pavement mixed with still bottoms may be used instead of new asphalt material, but the patches made of old materials are inferior in durability, although considerably cheaper.

If a binder of broken stone or gravel is used it may be mixed in the same way, but the stone or gravel should not be heated above 250°, and even at that temperature some cold stone can be added.

AS TO COST.

One cubic foot of sand, screened and dried, cost, say	$ 0.05
15 pounds lime stone	.025
15 pounds asphalt cement @ 1½ c. per lb	.225
Total cost material per cub. ft.	$ 0.30

One cubic foot of the mixture will, of course, lay six square feet of pavement, two inches thick, or five cents per square foot, or forty-five cents per square yard for material alone. The other items are fuel and labor. As wood is the most convenient fuel, and wood is expensive in cities, the item of fuel is higher than one would think. Probably a cord of wood per day would be used by a small gang of men. As to labor, six men should cut out an old pavement, mix and lay new material for about twenty square yards per day. The cost of asphalt surface on this basis would be:

Material, 20 sq. yds. @ 45c.	$ 9 00
Fuel, 1 cord wood	4 00
Labor, 6 men $9.00, foreman, $2.50, cart $3.00	14 50
Total	$ 27 50
Cost per sq. yd. 27.50÷20.	$ 1.37

SEWER PIPE JOINTS IN ENGLAND.*

By John A. Turner.

Since the "Model" by-laws have been accepted and put into force by the different local authorities the question of sewer pipes and the method of joining them has received rather an unusual amount of could be expected, the production of numerous methods of joining, each inventor claiming more or less advantage over that of his neighbor. They have, however, been unanimous in their aim to

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joints were made up as shown in Fig 1, *i. e.*, by means of a ring of tarred spun yarn or gaskin and run with liquid cement.

Though this made a tight joint it was found, especially where the sewer was laid in faulty ground, to be too rigid, and whenever any subsidence of the ground took place it was liable and often did cause the pipes to crack and render the sewer defective and unsanitary. Then, too, this method of jointing was not easily nor satisfactorily performed in trenches that were water-ridden, and I have no doubt that this reason coupled with that of the liability of the ground to settle led to the introduction of the Stanford joint and its many modifications.

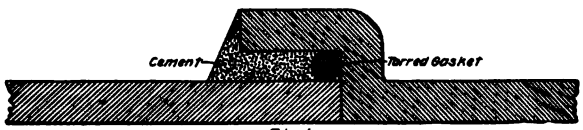

Fig. 1

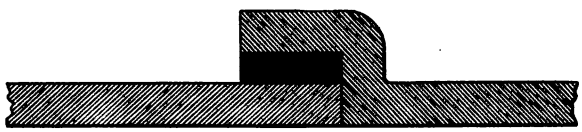
Fig. 2
Stanford Joint

The "Stanford" is formed by the contact of two bands of composition, one cast on the spigot and the other in the socket of an ordinary pipe. This is shown in Fig. 2.

It will be seen from the figure that the joint is made with beveled surfaces, and that by the insertion of the spigot into the socket a perfect seal is given to the pipes. The joint could also, were it necessary, be laid under water without difficulty.

The casting of the bituminous material that forms the bands on the pipes entails some little attention to ensure success and in some of the joints which are illustrated it is quite an elaborate process.

Only the best pipes are selected, for any twist or defect in shape would not allow the pipes to be centered true in the molds that receive the molton composition. The pipes before being fixed in the molds are chipped with light hammers and all traces of glaze removed from where the jointing material is attached. This is necessary as the liquid will not attach itself where any glaze is allowed to remain. The ingredients and the making of the Stanford joint metal is as follows: Into an iron cauldron built in a convenient fireplace, about two gallons of tar are melted together with a small shovelful of sulphur. The two are agitated till the sulphur has become thoroughly mixed with the tar, then a quantity of sand is added and the lot kept constantly on the move till it becomes so thin as the heat will make it without boiling over. It is now ready for the molds, (into which the pipes are already placed) and hand ladles, with spouts attached, are employed to carry the liquid from the cauldron and pour it round the pipes. The mold must be well oiled and also heated, the oil preventing any adherence to the mold, and as the latter is heated it does not in any way chill the hot liquid but allows

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it to run well and evenly around the pipe. A few minutes suffice for the material to set, when the pipe may be removed, and after being cleaned is ready for export.

With different firms the ingredients that go to make up this material may vary, but it only requires a little experimenting to produce a satisfactory "metal."

Other joints that depend on this bituminous material follow out these lines in the casting on the pipes, but they have of course special molds for their particular shape.

flexibility that is permitted by the spherical shape of joint allows a greater deviation without damaging the joint or pipes than in any other joint. In Figure 4 we have the same joint in combination with Figure 1.

The pipes are made with sockets of extra depth to permit the addition of Portland cement on the outside of the bands, to give additional security to the pipes.

Hassall's joint, shown in Figure 5, is one that has come considerably to the front, and is a thoroughly

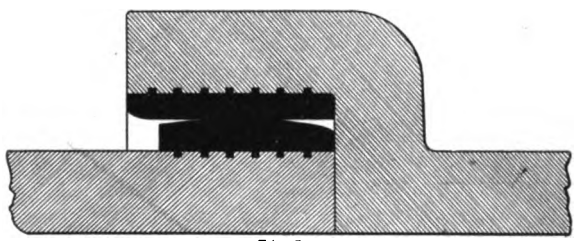

Fig.3
Doulton's Joint

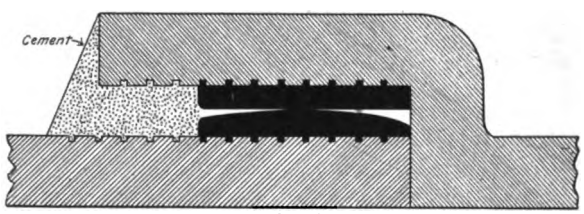

Fig. 4

Figure 3 represents Doulton's self-adjusting joint, and this is without doubt an improvement on the original Stanford. The band in the socket in this case is made parallel while that on the spigot is of a spherical form and therefore

substantial one. It is formed by two bands of bituminous material being cast on the spigot end of the pipe, and two similar bands in the socket, so that when the two are joined an annular groove is formed into which Portland cement is

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spigot end of the pipe. In these bands are grooves that form an annular space when the pipes are laid together. Portland cement is run into this space perfectly securing and sealing the joint. An important feature in this joint is that the cement key is surrounded on all sides with bituminous material and as this is flexible it allows for any deviation that may be caused by the ground settling, still the while maintaining the seal.

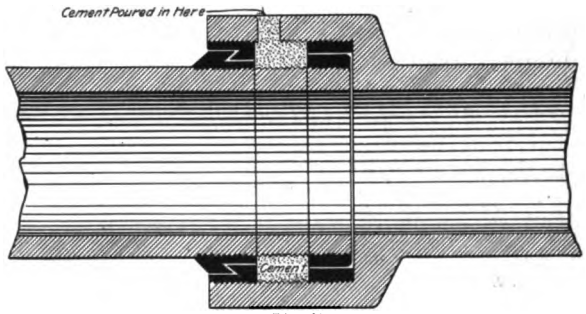

Fig. 5
Hassall's Double Lined Joint

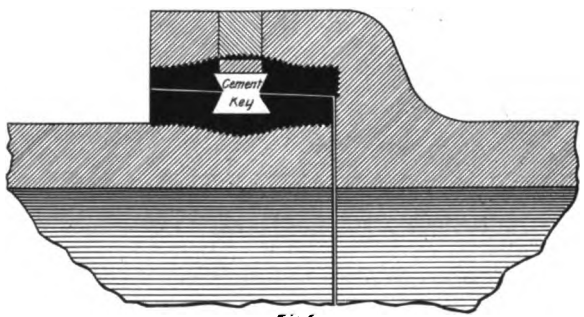

Fig. 6
"Boutton's Secure" Joint

Syke's patent screw joint, Fig. 7, is another reliable joint that has its special advantages. The jointing material is run into the form of a screw, the socket being threaded in a similar manner to that of a nut, the spigot taking the part of the bolt. To make the joint the spigot is inserted in the socket and screwed till the two faces meet and compress the jointing material that is on the outer diameter of the spigot screw. This joint like others that are made with composition rings may be laid in water-logged ground, and as grouting is dispensed with, no obstruction is liable to be formed in the inside of the pipe on that account.

The making of the pipe is, however, more costly owing to the spigot end having a special collar attached and when the pipes are of big diameter great care is necessary in the handling when in the trenches.

Fig. 8 represents Green's "Truinvert" pipe joint, another modification of the Stanford. The ring of composition in this case is taken to the outside edge of the socket, and the latter is so shaped that when the pipes are coupled a space is created to receive cement. In the illustration it will be noticed that an inner socket is formed at C, with an outer collar F, of Stanford

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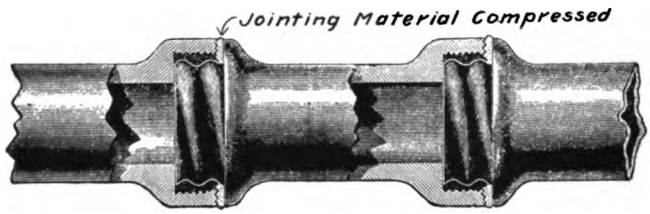
composition. When the pipes are in position the space E between C and F is grouted, the joint C having first been made tight with a special cement that the makers supply with the pipes.

The inventors claim that unless the face C is first made good it is impossible to make the joint so that this acts as a detector, and ensures the grouting to be done satisfactorily.

The most recent of the joints is that which is being introduced by



Sykes' Patent Joint
Fig. 7

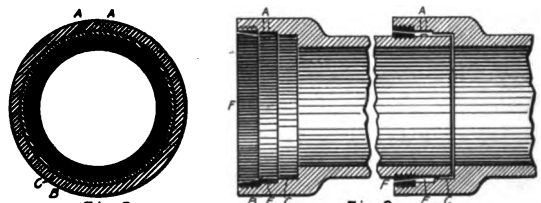


Fig. 8 Fig. 9

Green's Patent Truinvert Pipe with Detector Joints

Lowt's Sanitary Pipe Joint Syndicate. In the illustration, Fig. 10, the method of making these joints is shown. Sockets are entirely dispensed with, the invention claiming this along with the special composition, and the mode of applying it on the pipes.

This latter is done on the track where the pipes are to be laid, by

in the trenches. In Fig. 11 is shown a recent test that was made of the joints, the pipes being joined straight and afterwards bent. The proprietors say that a pressure of 28 lbs. per square inch was obtained before signs of leakage appeared. I should imagine that this method of jointing would be very useful in repairing a broken pipe on any sewer.

In Fig. 12, we have the Archer joint. In this the principle of the tongue and groove is adopted. A flat band of bituminous material is pressed against the inner and outer flanges at the base of the tongue while the pipe is on end, the tongue itself remaining undressed to come into contact with the liquid cement that is added when the pipes are fixed. In some cases clay is used to make the seal to permit the cement being poured

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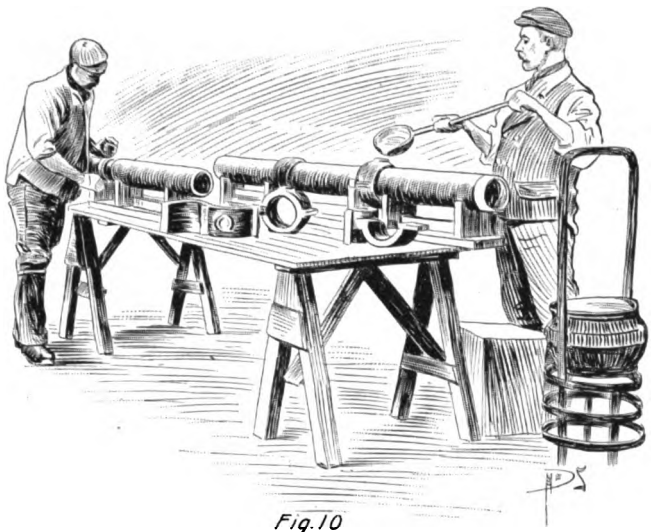

Fig. 10
Showing Method of Making Joints on Surface of Ground, before Laying in Trenches

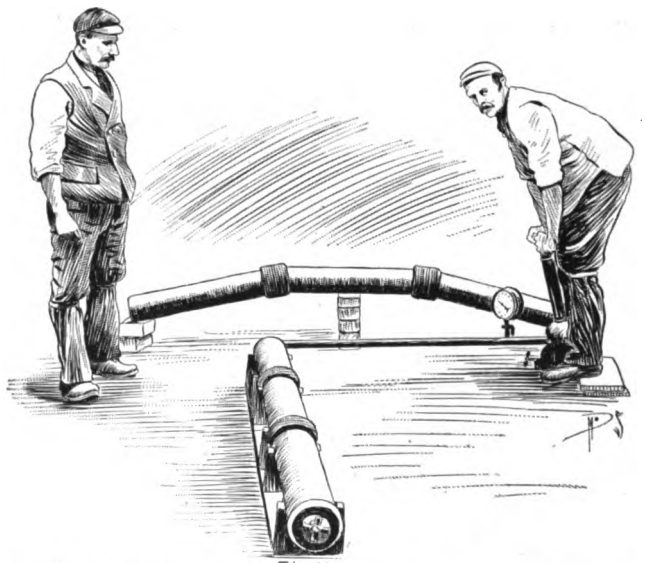

Fig. 11
Pipes Joined Together, Afterwards Bent, As Shown above, and Tested to a Pressure of 281 lbs. to the Square Inch

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means of a cord through the pipes after a number have been laid.

A joint certainly possessed of originality is Place's "lock" joint.

Fig. 13. In this the Stanford material is cast only on the lower

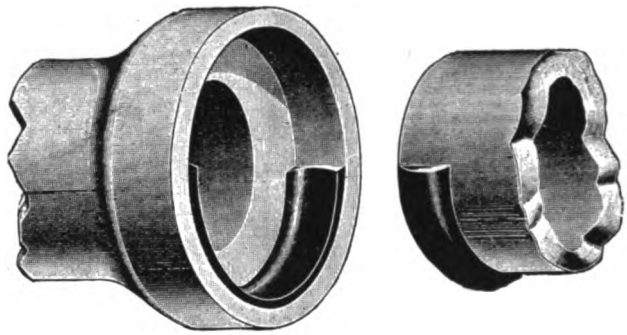

Fig.13
Place's "Lock" Joint

Fig.14

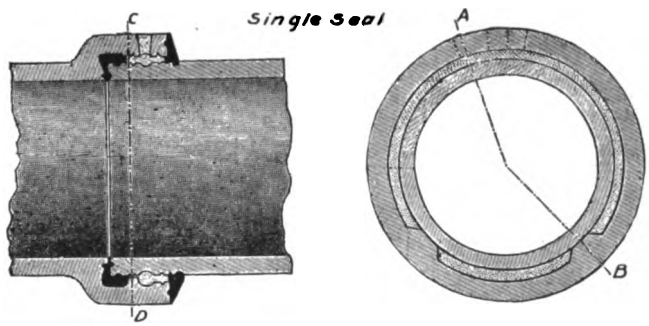

Fig. 15
Ame's & Crosta's Joint

half of the pipe in the form of a ball and socket joint. When the pipes are put together a wedge is inserted at the top, thus insuring a true alignment and preventing any withdrawal. Cement is then employed to fill in the remaining space.

This joint completes rather a formidable list that is dependent on Stanford composition to make a reliable seal, with the addition of cement to more perfectly secure the joint from parting.

A few other types are on the market in which the inventors have purposely avoided any assistance beyond cement, depending upon the design of their sockets to make a good coupling.

One of these is the Paragon, Fig. 14, in which are a number of

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grooves formed in the socket and spigot, making annular spaces to hold cement when fixed together. Varying depths of sockets are to be had, as is the case with other patent joints, to suit the different drainage requirements.

Ames & Crosta's self-adjusting joint is illustrated in Figs. 15 and 16. This joint is made in two shapes known respectively as the single seal and the double seal joint.

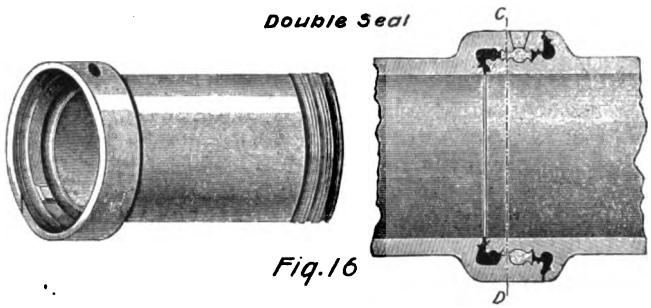

Fig. 16

Ames & Crosta's Joint

The latter is designed specially for use in water-logged ground, and differs only from the former in having an extra collar formed on the spigot. The general construction of the pipes will be understood from the illustration and it will be seen the sockets have special pieces for the spigot ends to rest upon to bring the pipes true together. In making the joints clay or other suitable material is inserted at the bottom of the socket and the spigot forced home. A fillet of the same material is then placed on the outside and the joint grouted with liquid cement. The double seal joint requires the outer fillet of clay to be inserted before the spigot is forced in, and it is then grouted like the single seal. All the surplus clay is removed from the interior of the pipe leaving a clear way in the sewer. There are a few other joints that might be described, but as their shapes are only modifications of what is illustrated here it is not necessary to entertain them.

WHAT IS A WATER PLANT WORTH?

By Charles Carroll Brown, M. Am. Soc. C. E.

There are two sides to this question—that of the present owner, who will be assumed to be a water company, and that of the purchaser, who will be assumed as the city which has granted a franchise to the company at some time in the past. If this franchise still has some years to run it has a value which must be considered. If it is practically a perpetual franchise, its present value can perhaps be more easily determined. If the franchise period is about to expire or has expired, and the company has received due notice, even if unofficial, that the city proposes to purchase the works, the value of the franchise may be neglected. The question then arises as to the

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value of the plant. The claims of the company will probably be that the new construction has cost a certain amount, including the renewals and possibly the repairs, and that this is the value of the plant to them. The city will not admit this claim, especially if the company has been making money, averring, very properly, that the company has received its profit from the operation of the works with the full knowledge of the fact of this determination, and that the works are worth to the company no more than their present value in the ground, all parts being more or less close to the need of repair on account of the destructive effect of the natural causes always at work. A close estimate of this value can be made by a careful examination of all accessible parts and of many points in the lines of pipe, with full information of the original condition of the pipe and of the date of laying.

Without a franchise there does not seem to be any other ground on which the company can base a claim for compensation. If the works as they now stand were well designed and constructed the city could accept this basis. But it the works were badly designed and the faults in the design have not been corrected, or if there have been frauds in the construction, the works will be worth less to the city, the purchaser, an amount which is in some measure proportional to the sum which will be necessary to put the system in condition to give

mistakes of the engineers and officials of the company which could have been avoided by reasonable diligence in the employment of competent advisers, and it does not seem right that it should. The only difficulty is in drawing the line between reasonable courses of procedure, whose failure could not have been foreseen, and actual avoidable mistakes. This is the field in which arbitration must be resorted to most frequently.

In a recent example the errors in design were so flagrant and the failure to fulfill the terms of the franchise was so evident that the courts have decided that the franchise should not be issued. The value of the works to the city or any other purchaser is only a small part of the original cost of the works, which are, of course, practically new, since but little of the system can be utilized in a well designed plan.

The original cost of the works may have some consideration, but largely on the same basis as deterioration, that is, changes in prices are vicissitudes to be met in business, and reductions in value on account of reductions in prices of material are to be written off as so much loss. In like manner the company may insist on additions to the value if prices have risen since the works were constructed. An estimate of the cost of constructing an entire new plant would be of value in determining the present worth of the old plant if it were possible to make an accurate esti-

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ing the terms of the franchise, an arbitrary method of determining its value was fixed. Whatever this method may be, it is fixed by the contract and no deviation from it should be permitted. If, as is so frequently the case, the city relinquished all control of the term of the franchise, its value can be determined at any time by a consideration of the physical condition of the plant and its earning capacity. Strictly speaking, the value of the franchise is the earning capacity of the works which are properly designed and constructed and properly managed to give the fullest and most economical service.

Scarcely any system is so well designed and managed that its earning capacity could not be increased, so that usually the value of the franchise is actually greater than the earnings of the system would indicate. To the purchaser, however, the value of the franchise is less, in some proportion to the lack of perfection in the plant. The remainder, after deducting from the gross receipts the cost of operation and maintenance and a proper interest on the cost of new construction, is not, therefore, a proper basis for determining the value of the franchise. This amount should be diminished by the interest charge on sums sunk in badly designed constructions if they have not been written off of the capital account, and by the interest charge on portions which have been outgrown and replaced if the proper part of the cost of such new construction has not been charged to maintenance account. If the books have been kept properly these amounts can be determined readily. A balance should be struck between the estimated additional value of the franchise if the works were in the best condition possible and the diminished value of the plant to the purchaser on account of the new constructions or the reconstructions necessary to put it in this condition. The difference between the two should be added to or subtracted from the value determined from the actual earnings. These are the questions in this branch of the inquiry which must be submitted to arbitration. If the franchise has a definite life, its value is probably less than that computed in this manner. It is so dependent on local circumstances that arbitration should be resorted to in most cases.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

HOW OFTEN WATER-PIPES SHOULD BE FLUSHED.

Our supply is obtained from wells 400 feet deep, and distributed through about 8 miles of cast-iron mains. A red deposit is drawn out when hydrants are opened, if they are left disturbed for a time. Frequent opening of hydrants causes them to leak, but failure to open them causes complaint

pends on the rapidity of formation of the deposit. Three or four times a year is about the customary average, but is frequently not often enough. The deposit forms most rapidly in the lines having the least flow. Careful observation will show

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be arranged, but if it is necessary to use a hydrant, a gate can be set on the hydrant branch, and the hydrant so set that it will be easy to get at for repairs.

SPECIFICATIONS FOR ASPHALT PAVING.

Below are extracts from the specifications adopted by the board of public works of the city of Denver, as recommended to them by the chief engineer. Will you kindly advise how a pavement can be laid under these specifications, with the materials specified?

WEARING SURFACE.

1. Refined asphalt, containing not less than 80 per cent. of petrolene nor more than 20 per cent. of asphaltine, when laid, and it must be entirely free from paraffine or mineral wax.

2. Heavy petroleum oil, not exceeding 5 per cent. of the asphaltum.

3. Fine, clean, sharp sand.

4. Fine powdered carbonate of lime, granite or quartz.

The heavy petroleum oil must be free from all impurities and brought to a specific gravity of from 18 to 22 degrees Beaume, and a fire test of 250 degrees Fahrenheit, and if suitable sand can be found, the powdered carbonate of lime may be omitted.

From this hydro-carbon, or asphalt, shall be manufactured a cement which shall have a fire test of not less than 250 degrees Fahrenheit, and shall be composed of 100 parts of asphalt and not more than five parts of heavy petroleum oil.

The above specified asphalt or hydrocarbon shall be either Trinidad Lake asphalt, from the Pitch lake in the island of Trinidad; Bermudez lake asphalt, obtained from the Pitch lake in the province of Bermudez, Republic of Venezuela; Pacific Asphalt Company's "Grizzly" asphalt, obtained from the mines of that company in Santa Barbara county, California, or the Alcatraz asphalt, obtained from the mines and refined at the refineries of the Alcatraz company in Santa Barbara county, California, and all shipping bills from these origins to Denver must be submitted to the inspection of the board.

The wearing surface will be composed of:

Asphalt cement from	12 to 18%
Sand from	85 to 62%
Pulverized carbonate of lime	3 to 20%
	100 100%

Enquirer, Denver, Col.

This subject is quite fully discussed in a report by Dr. S. P. Sadtler on some samples of asphalt examined for the city of Los Angeles, which is printed on page 332 of the number of MUNICIPAL ENGINEERING for June, 1898; in a criticism of this report by Mr. A. W. Dow, on page 327, and in editorial comment on the same on page 350 of the same number. It is clear from this discussion that there is not sufficient agreement as to the methods of analysis to be used nor sufficient concordance of results by chemists using the same methods, to warrant a definite statement of the exact amount of asphaltine or petrolene to be permitted. It is not probable that chemists working independently and by their own methods would agree within any reasonable limits with the proportions given in the specification. Even if the specification prescribed the method of analysis to be used, the agreement would not be satisfactory. Moreover, good asphalts for paving purposes differ very largely in constitution from the prescribed ratio of four or more of petrolene to one to asphaltene. Dr. Sadtler's ratio is three to one, and Mr. Dow finds good pavements having ratios from four to one, down to two to one or even less.

The amount of petroleum residuum or liquid asphalt to be used depends upon the consistency of the asphalt, and for some of the asphalts prescribed is much more than five per cent. The kind of sand also makes a difference in the proportion of oil. The list of asphalts which may be used includes nearly all of those with which pavements have been laid in this country with some measure of success, but it seems practically impossible to use some of them under the clauses of the specifications quoted, so that the list of acceptable asphalts is shortened by a strict application of some of the requirements. This is

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unfortunate if the fullest competition among companies using the materials listed as acceptable is desired.

TANKS FOR THE SEWAGE OF SMALL TOWNS.

As we live in a small town without sewerage, we are very desirous of obtaining some kind of water closet that will decompose the fecal matter. We can not use the common cesspool for fear of contaminating the adjacent wells and the common privy is objectionable. I saw a closet in Louisiana that discharged into a tight vault and the solid particles were decomposed and passed off as pure water without any smell. Can you give a description of such a vault which is a practical success?

Chas. R. Clark, Rome, Ky.

Such tanks are in use in Urbana and Champaign, Ill., for disposing of the sewage of several thousand persons, and there is no apparent reason for thinking the same process would not work well for one or more houses using water closets. Grease and garbage would not be taken care of, but water closet drainage would be satisfactorily disposed of. The principal requirements are, (1) depth and width enough to make the flow of water slow, if it is continuous. If it is intermittent, the width need not be so great, but the depth should be three feet or more in any case. (2) Two or three partitions across the line of flow, projecting down 18 to 24 inches below the surface of the water to stop the floating matter. (3) A wier the width of the tank over which the effluent flows, after which it is gathered into the outlet pipe. (4) Complete darkness, to be secured by tightly closing the tank, ventilators to be so constructed as to cut off the light. This seems to be essential. A black sludge is slowly formed in the bottom of the tank, which can be pumped or dipped out when necessary. Odor from the effluent of the tank is evidence that cleansing is needed. The effluent is not perfectly clean water, though it is clear, and should find its way promptly into a stream. It might produce some nuisance if undiluted and its flow is obstructed. Some description of the tanks of Champaign is given on page 93 of MUNICIPAL ENGINEERING for February, 1898.

DIFFICULTIES CAUSED BY WATER-SUPPLY MAINS THAT ARE TOO SMALL.

We take water from a mountain stream, carrying it about a half mile, through 400 feet of 4-inch pipe, and the remainder of the line 3-inch pipe, with a 2-inch waste at the end which supplies a stamp mill. Our elevation is 166 feet and the natural pressure about 70 pounds. We have 15 to 20 taps on main for consumers, ¾-inch and 1-inch, besides 7 or 8 fire plugs and public hydrants. We have great trouble to get sufficient supply, especialy in winter, when we are compelled to run the 2-inch waste to keep mains from freezing.

Can we now change taps on the main to, say, ½-inch, using reducer and unions, and leaving consumers' pipe as it now stands? Would consumers' supply be all right, and what would the company gain?

G. F. Johnson, St. Elmo, Cal.

Your principal difficulty seems to be too small a supply main. Sufficient data for accurate and complete answer are not given, but, assuming that the 2-inch waste is a short pipe, it will discharge nearly all the water that can be brought to it by the 3-inch pipe, leaving very little for consumers. Reducing the size of taps at the main will reduce consumers' pressure and increase their complaints. Reduction of the waste is better, though it will require better protection of pipe from frost. An engineer, furnished with a profile and full description of the line, could soon locate the exact points of difficulty and make recommendations of the changes necessary to give adequate supply.

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WATER FILTERS FOR DOMESTIC USE.

The question has been confronting us of either adopting a house filter and selling the same to our water consumers where desired, or putting in a filtering plant. The first plan involves so much less expense that we will probably adopt it, as so much of our water is used for manufacturing purposes, etc. We desire to adopt the best and most satisfactory filter made, and will be glad to have from you a recommendation or the addresses of water filters for domestic use that you can recommend.

E. C. B., Patton, Pa.

The answer as to the kind of filter to be adopted depends upon the character and amount of pollution, data regarding which are not given. It may be that a filter plant for the entire supply would be more expensive than the individual filters, but this will hardly be true unless the proportion used for manufacturing and not requiring filtration is very large. The Jewell, Warren and Hyatt filters, manufactured by the New York Filter Company, are good and can be operated economically on almost any scale, as their manner of operation can be modified to suit the kind and amount of pollution. The principal requirements in small house filters are ease of cleaning, accessibility, refusal to work when cleaning is needed, and ease of sterilization if the water is polluted by sewage. Filters on the Pasteur principle fill these requirements. In some cases one filter for several houses will be most economical, the filter to be in charge of the water company. It may pay to furnish filters at cost, or even less, rather than filter the entire supply. Computation will determine.

GRADE OF ASPHALT PAVEMENT.

Is it safe or advisable to lay asphalt pavements on a grade of 8 per cent. or more? What is the limit of grade for such paving?

S. C. C., Lafayette, Ind.

A proper mixture of asphalt can be laid on an 8 per cent. grade, or even greater, which will stay in place. In our northern cities there will be a number of days each year when it will be difficult for horses to get up or down such a grade, quite dangerous and even impossible with a heavy load. Asphalt pavements have been laid successfully on even heavier grades than 8 per cent. There must, however, be other streets for getting up or down the hill at times when the asphalt is slippery, or it must be thoroughly sanded. Under the ordinary conditions in American cities it is not advisable to exceed a 5 or 6 per cent. grade.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

ASPHALT BLOCK FACTORIES AND MACHINERY.

Where are asphalt blocks made in the United States, and who is the maker of the machinery? I ask as the representative of interested parties in Australia.

Robt. Kunstman, C. E., Chicago.

There are several plants where compressed asphalt blocks and tiles are manufactured, the principal ones being the Asphalt Block Company, Philadelphia, Pa.; Maryland Pavement Company, Baltimore, Md.; Washington Asphalt Block and Tile Company, Washington, D. C. The principal maker of machinery for the use of compounding crushed stone, asphalt, etc., and compressing them into various sizes and shapes of blocks and tiles, is the International

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to them, especially the last, will obtain illustrated catalogues and description of work. The composition of the blocks, we believe, varies slightly with the climate where they are used. You must satisfy yourself as to the conditions of climate, traffic and method of laying the blocks for the locality in which you are interested.

BY WAY OF COMMENT.

Opportunity for a New Beginning of the League of American Municipalities

The League of American Municipalities, composed of mayors, aldermen and councilmen, will meet in Detroit, August 1st to 4th. This is the first meeting since the formation of the organization at Columbus in last October. The local committee in charge of arrangements for the meeting has worked hard for several weeks to make the meeting a success, and offers generous entertainment to those who may attend. Unfortunately, it has been at considerable disadvantage on account of the embarrassments of the League, which are known to some extent to the public.

The movement which resulted in the formation of the organization was started and promoted by people whose evident purpose was to use it in connection with business interests. When it developed at Columbus that it was hoped to accomplish this by the election of one of these men as permanent secretary, the position which would give the largest opportunity for establishing relationship between the League and private business interests, the gross impropriety of the connection was pointed out in vigorous speeches before the convention, by prominent municipal officers, who hoped to see the organization placed on a high plane. Mayor Quincy, of Boston, Mayor Jones, of Toledo, and Mayor Lagger, each appealed strongly to the convention to save the organization from this embarrassment, which, if forced upon it, would, they predicted, seriously interfere with its usefulness. Mayor Jones appealed to the patriotism of the candidate, and publicly asked him "to retire in favor of somebody who is not connected or associated with commercial interests." The impropriety of the candidacy was recognized in the assurance given in the nominating speech that the name would be withdrawn, if thought advisable. Although this was strongly urged by several speakers, purely in the interest of the organization, and not as supporters of any other candidate, for there was no other candidate, the appeal was in vain. The selfish purposes which had brought about this result disgusted many, and the League has suffered immeasurably in public estimation. While it continues thus in question its usefulness will be impaired.

This magazine is one of the pub-

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lications which has earnestly criticised the League for permitting itself to be weakened by its embarrassments. The secretary, months ago, sought a suspension of this criticism by suggestions indicating lack of proper appreciation of the position in which the organization is involved. The cause for criticism can be removed only by complete divorcement of the League from connection in any manner with kindred private business. The League should not permit itself to be in the slightest degree subject to suspicion.

Ample evidence is available to show that the consequences of the mistake made at Columbus have been serious—more serious than was probably apprehended by those who recognized the mere possibility as sufficient reason for their opposition.

The mistake which was made at Columbus should be corrected at Detroit. If not, the League will stand before the public in an attitude far more reprehensible than at present. It is now the victim of a mistake committed under circumstances which permitted little deliberation on the part of the League, but a willful continuation of that mistake becomes something that can not be so mildly excused.

The Detroit meeting will, according to the action that may be taken, determine the future usefulness of the League. If it permits itself to be used as an instrument for mercenary purposes, it will be known to the public as of this character. If it is placed on a high plane as an independent and dignified public organization, free from all improper connections, it will be unhampered in its possibilities of usefulness. It can become the latter by electing as its officers men of ability and irreproachable character, chosen from accredited members who are municipal officers, and surely there may be found among municipal officers enough of such men to make it unnecessary for the League to place its affairs in the hands of outsiders for manipulation in connection with private interests.

Denver Water Works.

The city of Denver is very likely to appeal from the latest decision of the court in its cases against the water company. The company seems to have been able to convince the court that a large quantity of water at 90 pounds pressure is better than the old system with contract pressure of 115 pounds, and that the acquiescence of the city in the construction of the new system relieves the company from the contract regarding pressure. The court is not an expert in hydraulics, nor is he a fireman or a fire commissioner, who must supply the necessary fire engines to make up for the reduction in pressure, or he would see the great additional expense to which the city must be put on this account. It is hard to see why a failure to give the present ample supply at the contract pressure is not quite

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as reprehensible, theoretically, at least, as the former failure to give enough water, though the contract pressure was maintained.

Chicago River Navigation.

The agitation for the improvement of navigation in the Chicago river is rapidly gathering force, and definite steps must be taken very shortly. The question of replacing the bridges with piers in the river by bascule or folding bridges is now under serious consideration by the authorities with prospect of a speedy determination to make the improvement. The great increase in size of vessels with the improvements in the various channels of the lakes and their connecting rivers makes necessary some widening and straightening of the river channels, especially in the south branch. Projected plans for such work are numerous, and definite action of congress is awaited with impatience. So far as the tunnels are concerned it is just as well for the city to acknowledge at once that its foresight was not sufficient to discover the march of improvement, and prepare to pay the penalty by proceeding to lower the tunnels so that their roof will no longer be obstructions. The companies operating or owning them should pay some portion of the cost, but the city will doubtless be obliged to bear most of the expense. Prompt action is necessary as there are already indications of a removal of some business to more convenient ports.

Glasgow's Methods.

The city of Glasgow, Scotland, is often pointed out as an example of the best manner of city government, and certainly from a business point of view the results have been very satisfactory. The city owns its gas and water plants, its street railway system, a labor bureau, is bound to maintain and has charge of ten churches, provides public washhouses and baths which are so low in price as to be almost free, owns several model lodging houses and dwellings for working men, gives concerts during the winter at an admission of one penny, and many band concerts in summer free, has opened a "Peoples Palace," has laid out a golf course with a rate of 2d a day for playing, has its own hospitals and is very much disturbed because the governmental authorities have refused the privilege of purchasing the telephone system.

The city is also considering the cleansing of the Clyde river, the establishment of free libraries, the application of electricity to street car lines, municipal control of the public houses, and the council has resolved to build themselves what one member called a "home for decayed councillors."

Granted two or three premises, the steps taken by the city are logical and, in the hands of honest men, which seems to be the case, the results will be financially satisfactory. The same can not be said of the effect upon a large class, if not upon all, of the citizens, when

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the poison concealed in the external success has had time to work.

The city takes charge, not only of those legitimate lines of municipal activity which have to do with the welfare of all citizens, without regard to occupation or position, but it takes or proposes to take in hand the amusements, and the purveying of personal conveniences of its citizens, and carries its charities so far as to make the pauperization of large numbers a probability if not a certainty. It points to the result in ancient Rome, where the citizens were all supported by the state, but can not reach that stage from the lack of slaves and revenue from conquered dependencies to pay the cost. The present results in Glasgow are very satisfactory, but the absence of basis in correct principles will bring future disaster. Some of the reasons upon which this statement is based will be given hereafter.

Mobile Sewers. The city of Mobile, Ala., is a large city to be without sewers, and it has recently had plans for a system prepared. Much of the city is very flat and near the tide level, so that ultimately an intercepting sewer and a pumping plant will be necessary. At present there are several submerged outlets in which proper provision for securing the maximum velocity of flow possible seem to have been taken. Large provision is necessarily made for flushing the sewer and it is proposed to turn the flow from an artesian well through one or two of the branches. Some such procedure will certainly be necessary with the minimum gradients necessarily adopted, unless the sewers are watched closely and are frequently cleaned by flushing and by hand labor. Until the system is in full use by all abutting property, the assumed amount of sewage producing the cleansing velocity of flow will not enter, and the deficiency must be made up by a constant flow of water from an extraneous source. There are several storm water systems with the low gradients here used. It will be interesting to note the working of a system for sewage only.

Concrete Abutments for Bridges. A recent example of the use of concrete in place of masonry is found in the abutments of the three-track bridge over a branch of the Erie canal, in Buffalo, on a branch of the New York Central railroad, the renewal of abutments being made necessary by the deepening of the canal. The lower 18 feet of the abutments, below low water line, is constructed of concrete and the 13 feet above this level is stone masonry. The concrete was made of one part Atlas Portland cement, one part sand and six parts of crushed limestone, passing through a two-inch screen. The fine stone in the mixture is considered to take the place of one part of sand, making the proportions 1:2:5, very nearly. The cost of the concrete, laid in a coffer dam, was $6.50 a cubic yard, and the

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cost of the stone masonry, laid above water level, was $7.93 a cubic yard. Four turns of the rotary concrete mixer, equivalent to sixteen turnings by hand, secured thorough mixture of the materials. The concrete was laid in plant molds in ten-inch layers and thoroughly rammed. Connection was made between the layers laid in the afternoon, and the first layer laid next morning by means of a thin grout of clear Portland cement. No finish was given the surface as it will always be covered. The appearance of the stone masonry above is very handsome, but the concrete could have had an equally fine face if it had been used.

Observation of stone piers adjoining similar piers which had received a coating of cement concrete, shows that ten years abrasion by floods and the debris they carry had less effect upon the concrete than upon the stone masonry. The standard abutment finish on the New York Central being massive rockface sandstone, limestone or granite, probably determined the use of stone where the abutment is visible. The use of the fine screenings of limestone in the concrete instead of one part of sand, when accompanied by the thorough mixing, largely increased the strength of concrete. Many results by A. Noble, during the construction of the Memphis bridge, show that the use of screenings instead of sand in mortar, increases the strength of briquettes from 50 per cent. to more than double, and that the addition of one-fourth of one part to one part of screenings to a mortar composed of sand and cement increases the strength at a year 25 to 50 per. cent. or more. Sabin's results at the Sault canal indicate the same thing as far as they go. Professor Talbot has a few short-time tests of the compressive strength of concretes with various proportions of sand, fine screenings, coarse screenings and stone, which indicate the same conclusion. The mixture used with the proportions, 1 cement, 1 sand, 1 screenings, 5 stone, is then stronger than if the screenings had been omitted, and is, therefore, much stronger than if the mixture had been in the proportions 1 cement, 2 sand, 5 stone.

The use of concrete in place of masonry is extending, and the great improvement in American Portland cements, their greater uniformity and reduction in price will hasten the extension of its applications to many constructions where it is now looked upon with suspicion. Prejudice has been largely banished so far as underground and under-water work is concerned, and is rapidly disappearing in regard to visible work as its advantages are demonstrated.

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AMERICAN SOCIETY OF CIVIL ENGINEERS.

A REVIEW OF THE PROCEEDINGS AT THE ANNUAL MEETING IN DETROIT, JULY 26–28.

[Special from Editorial Representative of MUNICIPAL ENGINEERING.]

DETROIT, July 27.—The American Society of Civil Engineers held a very pleasant meeting in Detroit. It was successful also in the sense in which that term is used in connection with the Society conventions. A list of learned papers is presented which have been printed and distributed to members some time previously, and written discussions are presented by members present and absent, followed by short discussions from the floor.

An interesting and rather startling paper, giving the results of some experiments on the flow of water in a new 6-foot pipe-line, at Ogden, part being wooden stave pipe, and part steel, was presented by Messrs. Marx, Wing and Hopkins. The results, giving the coefficient of discharge in the steel pipe in particular, varied so much from those usually accepted, that there was considerable effort to find reasons for these differences in various items, which members thought might have been neglected. The authors will have an opportunity later to reply to these inquiries. Two other interesting papers giving rise to considerable discussion, were, "Dredges and Dredging on the Mississippi River," by J. A. Ockerson, and the Reservoir System of the Great Lakes, and its relation to the problem of improving their navigation.

The principal business of these conventions, however, is not in listening to these discussions nor in taking part in them. In fact the program provides for but three sessions of about two hours each, and half of another session for this purpose. The remainder of the four days is given up to excursions, which in this case are largely in the line of recreation, and to receptions, or are left vacant to give the members time and opportunity for those interchanges of experiences and personal discussions which are a very large part of the business of the meeting.

One excursion to the Grand Trunk tunnel under the St. Clair river was in the nature of technical instruction, and the return by boat through St. Clair river and lake, gave an opportunity to observe some of the problems to be solved in the improvement of lake navigation discussed in one of the papers.

The people of Detroit, the Detroit Engineers' Club, the local members, the street car lines and railroads, all did their best to give the members an enjoyable meeting and certainly succeeded. As the beautiful pictures of Detroit scenery and buildings in this number testify, in part, there are few cities as well constructed and cared for and as well provided with entertainment.

The number of members present was about 200, and the number of guests, including families of members, was more than 200, making one of the largest conventions the society has held. It is stated that each convention is better managed than the previous one and that this meeting is no exception to the rule. The large attendance indicates that

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the present plan of conducting the meetings is satisfactory to the members, and it will doubtless be continued.

Some business of the society was discussed, but nothing of importance can be decided by the convention, and the most important part of the discussions of papers is presented in written form for later publication, so that the social features must be those most desired by the members as a whole.

The literary part of the meeting could perhaps be made of more interest by a careful selection from the papers presented during the year and by an effort to secure papers upon subjects of immediate interest, with more attention to the possibilities of a definite scheme of subjects than by allowing the papers to come as they may be presented by members. There was some indication of such a purpose in the program of this meeting but it was not very pronounced.

The tendency of engineers towards personal isolation and from concerted action of any sort is shown by the facts stated. Until engineers put into practice a principle which many of them recognize, the difficulties mentioned in the following extract from the annual address of president Fteley will not wholly disappear. The principle referred to is that it is possible to look so closely at the details of one's own work as to lose sight of its relations to other work and of his relations to his fellow men, and especially to his fellow engineers. The discussion of such topics as the one suggested by the president and others which will tend to broaden the view of the individual engineer and reduce his tendency to selfish isolation would not be out of place at such a convention as this, and, if carried on in proper spirit, would tend strongly to the increase of professional unity, and thus to an improvement in the estimation in which the engineering profession is held by the world at large.

Mr. Fteley said: "On the engineer often depends the integrity of the capital invested by those who repose their confidence in him, and on the soundness of his designs frequently depends human life, and yet, when the learned professions are enumerated, the engineer is often passed by. This is probably due to the comparative youth of our profession in this country. A generation ago the scope of its usefulness was very much more limited, but the field is being extended at such an increasing rate, and the money invested in engineering enterprises of all kinds is correspondingly so much greater, that our profession is steadily gaining in importance and standing. It is obvious that we can all contribute to that result by our individual professional efforts in our respective fields."

INFORMATION ABOUT MEN.

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ported father of brick pavements, upon which scheme he worked for years before securing permission from the council to lay a section of a block of the public square with brick. He has also invented a process of burning the surface of a road the same as if it were clay in a kiln, by which process it could be made as hard and as smooth as dressed stone. This plan has never been tried, however.

HAMMOND—Mr. D. J. Hammond, the efficient city engineer of Frankfort, Ind., is considering the question of entering the department of maintenance of way of the Pennsylvania railroad company. The city of Frankfort can ill afford to let him go as he is responsible for the excellent work which has been done on the public improvements in that city and has been very largely instru-

and compelled his old-time leader, after a fight to a finish in the courts, to relinquish the office of mayor. He has gone through many hot contests and has many victories to his credit. He has a high order of executive ability, a clear understanding of his official work and has been a valuable man to his city. Among the successful innovations inaugurated by him, in connection with the board of public works, is the organization of an efficient street cleaning force in the down-town districts. The fame of this work, as conducted under his direction, has gone beyond Detroit, and has been the subject of much comment in other cities. He brought about the placing of litter barrels on street corners in the central portion of the city; the substitution of stone for plank cross-walks at alley intersections and the

DE WITT H. MORELAND,
PRESIDENT OF BOARD OF PUBLIC WORKS, DETROIT.

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assisted in the capture of Jefferson Davis. For sixteen years he was a traveling representative of the St. Paul, Minneapolis & Manitoba railroad. He was for a time general agent of the Great Northern railroad, and was general agent at Detroit for the Northern steamship company. In 1894 he was appointed a commissioner of the water board of Detroit by Mayor Pingree. Two years later Pingree appointed him commissioner of the board of public works, and in last January he was elected president of the board. His term continues until January, 1900. With the exception of a period

Scotch descent and looks it. He was a printer before the war, served in the Fifth and Sixth New York cavalry, was subsequently employed on the Rochester (N. Y.) Express, Chicago Post, Peoria Mail, New York World and Rochester (N. Y.) Democrat and Chronicle. He was elected president of the International Typographical Union at the Centennial session in Philadelphia in 1876, but declined re-election because he believed the honor should be passed around. He has been identified with Detroit for over twenty-six years. He conducted the Detroit Commercial Advertiser for six years, was after-

JOHN McVICAR.

of two years his entire life has been spent in and near Detroit.

M'VICAR—In the city of Detroit one hears much of John McVicar in connection with local affairs. He is one of the men—with emphasis on "the"—who helped to give fame and force to the Pingree administration. He is no longer a city official, but he receives distinguished consideration as one who has been, and whatever he has to say on local questions has weight. He was not unknown to fame before he became a municipal officer, for he had long before been prominent as an almighty good newspaper man. He is a native of Kingston, Ont., of Highland-

ward managing editor of the Detroit Evening News for ten years, and the publisher, under oath, stated in court, that Mr. McVicar was the best man for the position he had ever come across. He increased the circulation of the paper from 17,000 to 40,000 daily. Later he took charge of the State printing office and the Lansing Republican, the affairs of which had been going wrong. He re-established the business and after it was on a good paying basis resigned. There had been no agreement as to his salary and when he was about to return to Detroit he requested the cashier to ask the proprietor on what basis settlement would be made.

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The answer was "Pay Mac all he asks; he will not ask too much," and the settlement was made on that basis. When Pingree was elected mayor of Detroit in 1890 he selected McVicar for secretary of the board of public works. The story of his official career is told as follows:

"He took hold with his accustomed energy, filled the commissioners full of new ideas, posted himself thoroughly on the powers and duties of the board, and its relation to the council, and June 30, 1891, published his first report for the board, which 'waked things.' The press took it up, pronounced it 'fearless,' and commended its comments and recommendations. A vacancy occurred on the board by the resignation of one of the three members, and Mayor Pingree nominated John McVicar as commissioner. The council had 18 democrats and 14 republicans, and Mr. McVicar had appeared before the legislature only a few months prior to this and roundly denounced the council's methods in connection with contracts, rings, etc., for public work, openly asserting that in the judgment of many persons certain members of the council (naming one who was present in the senate chamber, and pointing his finger at the member as he spoke) should be wearing stripes in Jackson prison instead of making city laws. It was a dramatic scene at Lansing in the session of 1891, and led to futile attempts to gag the energetic secretary. When his nomination was presented 27 members of the council were present—15 democrats and 12 republicans—and it required 18 votes to suspend the rules for confirmation the same evening. The honest members of both parties favored him, and his friends called for suspension of the rules, on which the vote stood 18 for to 9 against. Of the 18 favoring 9 were republicans and 9 democrats, the opposition being 6 democrats and 3 republicans. The vote on confirmation was then taken, and Mr. McVicar was confirmed, 23 to 4, there being in his favor 12 democrats and 11 republicans, and against him 3 democrats and 1 republican. This was in August, 1891, and on September 1 he entered upon his duties as commissioner. Bringing thereto the same energy of pur-

recommendations of Mayor Pingree for improvement were promptly pushed, and every detail was attended to faithfully and advances made beyond the mayor's suggestions, and thereafter Mayor Pingree did not need to bother himself in that direction. Tens of thousands of dollars were saved in every direction; the sewers constructed were of the very best in material and workmanship, and at reasonable cost; the pavements were placed on concrete foundations, and the changes in this respect in Detroit since that time have been remarkable. It is now one of the best drained, best paved and most thoroughly and economically cleaned cities in the United States. The millions of dollars expended in this grand work have been mainly under direction of John McVicar, and to him, more than to any other single individual, is the credit due for the improvements.

"For four and a half years Mayor Pingree relied upon him as upon few others for putting into effect the reforms he was advocating, and it has frequently been asserted that in the street railway improvement agitation, Mr. McVicar made figures enough and arguments enough on paper for Mayor Pingree to carpet Detroit's city hall. But Mr. McVicar is a very positive man, and frequent minor clashes with Pingree were taken advantage of by sycophants of the latter to cause a breach. Matters in the council took such shape early in 1895 that McVicar feared the old gang was again about to get control, the committees from a combination of democrats and republicans greatly resembling some of 1891, and he determined to make an effort to counteract or kill such influences. Mayor Pingree had favored an unpaid public works commission, with a single executive head to the department, to be appointed by said commission. Mr. McVicar drafted a similar bill, making a single head, to be known as Commissioner of Public Works, who should be appointed by the mayor after the expiration of the term of the commissioners then in office (all Pingree appointees), the commissioner having the longest time to serve to be head of the department until the new appointment by the Mayor. The bill

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cutting off public works patronage, etc. The bill, however, passed the senate, and was given immediate effect by a two-thirds vote; but it did not come up in the house until the afternoon of the last day of the session. Here it required fifty-one votes, and there were enough members in favor of it to pass it; but by good maneuvering of its enemies the vote was reached when more than a dozen members were out, and when only forty-eight votes could be mustered in its favor; hence it was defeated, with no time for resuscitation. Mr. McVicar then announced that he would do the best he could under a bad system until the end of his term, which expired in January, 1898, and soon became again as great a force as ever in the public works department."

Although identified with the opposition to the election of Maybury for mayor, there was afterward a movement in support of his reappointment on the board of public works. In editorially urging this the Detroit News-Tribune said of him last November: "A more competent man was never a member of the board. Mr. McVicar has mastered the details of the department's business. He has been indefatigable in his efforts and a stone wall for the protection of tax-payers. His career has been marked by a sturdy, even obstinate defense of the public treasury. He may have friends among the contractors who have profited by his good will, but the 'pull' he has recognized is the pull that comes from honest work at decent prices. Altogether his career as a member of the board is one that the city as well as himself may be proud of." He has bitter enemies and strong friends. He was given the united support of Michigan republicans for appointment as public printer under McKinley. He is now fifty-five years old.

PUFFER—Mr. Frederic E. Puffer, who contributes the article in this number of Municipal Engineering, explaining a simple method of making asphalt repairs, has had thorough experience in asphalt paving. He received his first instruction from two of the pioneers of the business, Cyrus Warren and Samuel R. Scharf, founders of the Warren-Scharf asphalt paving business. After a few years spent in the business department he was given charge of contracts. He has superintended the construction of asphalt pavements in many different cities, and his ten years of practical experience gives him exceptional qualifications for this work. As an asphalt expert, he now occupies an in-

FREDERIC E. PUFFER.

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dependent position. Prior to his entering the asphalt business he had some experience as a chemist in a wood pulp and paper mill. He is a graduate of Harvard, class of 1885, for which he prepared at Chauncy Hall School, Boston. He is a native of Sudbury, Mass., and is thirty-four years old.

CURRENT INFORMATION.

A Suit to Recover Paving Assessments in Louisville.

Suit to recover from the city of Louisville, Ky., various amounts, aggregating about $250,000, was filed July 18, by a number of property-owners, who sue to recover not only for themselves but for the benefit of all property-owners similarly situated. It is alleged that the present charter provides that the city "may annually levy a tax on each $100 of the assessed value of all property subject to taxation sufficient to keep in repair the public ways in said city." Under these charter provisions, it is alleged, during the last few years certain amounts have been levied, and during these years ordinances were passed for the original construction of streets, and in each case of these it was provided that "the contractor should guarantee his contract, etc., and the material composing same should be kept in good repair for a period of five years," from the completion and acceptance of the work. Contractors were required to deposit with the city treasurer bonds to the amount of 10 per cent. of the contract price. If the authorities were of the opinion that any repairs were needed on the work during the contract period they could give the contractor notice of such necessity, and if he failed to begin repairs within a certain period his bonds might be forfeited, sold and the proceeds used to make repairs. The city is charged with the duty of keeping the streets in repair, paying therefor out of the city treasury. At no time since July 13, 1891, it is claimed, has the city had the right to "assess or impose the cost of keeping any of the public ways in repair exclusively upon the owners of lots in the territory contiguous to such public ways." General ordinances for the improvement of streets were approved in July, 1891; July, 1892, and February, 1894, and under each of these the deposit of 10 per cent. to guarantee repairs by adding 10 per cent. when making bids, and this 10 per cent. was, in effect, the contract price for keeping the improvements in repair. The entire cost of improvements was apportioned among the property-owners contiguous to the improved streets.

The estimated cost of improvements by original construction, provided for by ordinances between July, 1891, and November, 1895, exceeded $2,500,000, all of which was charged against and paid by the owners of property abutting on the improvements. Of this sum 10 per cent. was illegally apportioned against them, being the contract price for repairs, and that it constituted a liability of the city. The plaintiffs claim that under ordinances the city collected from these property-owners taxes for the specific purpose of paying for street repairs, and that it was a mistake to charge them again with the 10 per cent. for repairs; that 90 per cent. of the cost of the improvements should have been made out of the property-owners and 10 per cent. out of the city. The plaintiffs claim that the city has, or should have on hand out of the money levied for the purpose, at least $250,000, about the amount the property-owners have paid for the city, and they ask that the case be referred to the commissioners for proof as to the improvements by original construction during the years mentioned, and that the amount for which the city is found to be liable be paid into court and apportioned among the property-holders entitled to it.

Causes of Delay in Paving in Denver.

The committee on streets, parks and public expenitures of the Chamber of Commerce, Denver, Col., has decided that the improvement of the streets of that city cannot be expedited until the city charter has been amended to suit the needs of the people.

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fore the committee on Charter Revision such changes in existing laws pertinent to the improvement of streets as will eliminate obstructing measures and obstructing men. Changes regarding the classes of materials were recommended as follows: The regulations under the charter should plainly provide for the admission of materials and kind of work, classified and stated, set forth in such language that all concerned would intelligently understand the way to have it done, from what it should be made and how, and its cost stated. This cost should be total to the end, engineering, inspecting, computation of interest, and include all the incidentals now left under a vague cover, only disclosed when the tax is to be paid. These should be made as clear and open as day to the property-owners and the contractor, and there should be a criminal penalty for any one interfering or deceiving. All improvements on streets should especially provide for a better system of restoring the surface of streets to their normal condition after excavating for sewers, opening the pavements or any disturbance of the surface, than now exists.

The Detroit Fight Over Paving Brick Specifications.

The prolonged dead-lock contest between the board of public works and the legislative branch of the city government in Detroit over paving brick specifications is probably nearing an end. The board of aldermen receded from its position on two contracts on July 19, and that Detroit papers regard as a victory for the board of public works. Some of the aldermen claim, however, that the fight will go on and President Moreland of the board of public works declares that he will never recede from the position taken by the board. The deadlock has caused a suspension of much-needed improvement work and this has caused general complaint. The termination of the fight will probably result in a great deal of work being at once put under way.

Public Work in New York and Brooklyn.

James P. Keating, commissioner of highways, has submitted a report to Mayor Van Wyck, of New York City, in which he reviews the operations of his department in each of the boroughs for the first quarter of the year, together with comments by the engineers in charge, upon the present condition of the streets and recommendations as to future work in each borough. Commissioner Keating's information as to Brooklyn was obtained from a detailed statement prepared by Mr. N. P. Lewis, engineer of highways, who declares that at least $12,000,000 will be required to place all of the streets of Brooklyn in good condition. Engineer Lewis proposes to accomplish this gradually, replacing fifteen miles of cobblestones with asphalt each year, the city and abutting property to bear the expense in equal proportions. He estimates the cost at $750,000 annually, or $375,000 for the city's share. He also recommends that at least $400,000 worth of street improvements, to be paid for wholly by assessment, should be undertaken each year in the outlying wards. Engineer Lewis's recommendations are indorsed by Commissioner Keating.

Cumulative Method of Voting Stock.

A decision was handed down recently by Judge Toney, of Louisville, Ky., in which he held that John L. Dodd is a director in the Louisville Bridge company. The suit was upon a question whether Mr. Dodd or James B. Speed was elected a director in the company at the annual meeting of the stockholders held on March 7. The shareholders who favored Mr. Dodd at the meeting were in a minority, and they decided to vote their whole strength for him and not disperse it on any other candidate. The system by which they voted is known as cumulative voting. The right of cumulative voting was denied by the majority, but was strictly adhered to by the minority. The board of directors declined to recognize Mr. Dodd as director, and he brought suit. Judge Toney held that the cumulative method of voting stock was valid and is good law.

A Decision Favorable to the Denver Water Company.

A decision was rendered in the suit of the city of Denver against the Denver Union Water company, July 8, by Judge Le Fevre, who followed the precedent established by Judge Thayer of the federal court, and held that there was no ground on which the city could successfully attack the corporation in regard to pressure. The question of purity or quality of water resulted generally favorable to the Denver Union Water company, but certain orders regarding the protection of the water supply, as asked for by the city, were made. Judge Le Fevre took into consideration, however, that during the pending of the trial the company complied with certain important demands of the health department, and, by doing this, disposed of several grounds of objection.

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A Club of Water Meter Users.

The meter-users in Peoria, Ill., have organized the "Peoria Water Meter Club," and appointed an executive committee. The purpose of the club is to have a constitution setting forth the objects of the organization, to establish a treasury and secure money to be used in employing an attorney to make a fight for the rights of the water meter users.

Interest as an Allowable Expense in Determining Water Rates.

The Supreme Court of California reversed the decision of the Superior Court July 3 in the suit of the Redlands, Lugonia and Crafton Domestic Water company vs. the city of Redland et al. In February, 1896, the municipality of Redlands fixed the rates for domestic purposes to its inhabitants during the year beginning the following July. The water company brought suit in the superior court of San Bernardino county to have this ordinance annulled upon the ground that the rates prescribed would not yield enough to pay the interest upon the corporation's indebtedness, operating expenses, taxes, keeping the plant in repair and replacing worn-out parts. The Superior Court found that the income of the company during the year would only be $20,749.08, whereas the expenses would run up to $22,367.60, and thereupon annulled the ordinance directing the Redlands board of trustees to fix the rate so as to compensate the water company for the outlay of its expenses, the payment of interest, and to assure it a reasonable and just compensation for supplying water to the town.

The trustees appealed from this decision, and the supreme court reversed it and ordered a new trial, on the ground that the interest upon the indebtedness of the water company is not a proper item of expenditure to be considered in fixing the annual rates to be charged for furnishing water to the inhabitants of a city, and that the company is not entitled, either to have the rates so fixed as to enable it to set apart a certain sum each year as a sinking fund for the depreciation of its plant. This decision leaves it for the superior court to now determine whether, after these two items have been deducted from the expenditure account of the company, its net income under the rate are mixed at a temperature of 200 degrees; this is spread one and one-half inches deep upon roads that have been leveled and rolled and on top of it all is spread a layer of broken rock. This pavement lasts for years if there is good drainage. It is laid for a width of thirty feet in the center of the roadway and costs 5 cents a square foot.

When a City Cannot Terminate a Lighting Contract.

The Supreme Court of Kansas has rendered a decision in the case of Mills vs. City of Osawatomie, in which the city granted a franchise and entered into a contract with a party "to construct, reconstruct, maintain, repair and operate" an electric light plant for furnishing light to the city for a period of eight years. The right to rescind the contract for non-performance was not reserved to the city in the contract itself. This plant was built and operated under the contract for a long time, when, without the fault of the owner, it was partially destroyed by fire. The owner determined to rebuild the plant, and, without unjustifiable delay, proceeded to do so. The city, although well aware of this fact, gave no notice of a purpose to terminate the contract until the plant was practically rebuilt. The owner brought action against the city to prevent the annulling of the contract, and on appealing to the Supreme Court, it was held that the city could not terminate the contract, nor repeal the ordinance granting the franchise. The court held that if a party has a right to rescind a contract, he must exercise the right within a reasonable time, and not wait till a rescission will work a great injury to the opposite party.

Legality of Contracts for Maintenance of Asphalt Pavements.

A decision has been handed down by the Court of Errors and Appeals of New Jersey, in the case of Wilson vs. inhabitants of city of Trenton. The plaintiff asked that a contract which the city had made, for paving a street on which he owned property with asphalt, be set aside. He claimed that the contract was unlawful for the reason that, besides requiring the contractor to lay a good pavement, it bound him to guarantee

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repaving beyond the stated price, which was said to be inadequate. The result of this, it was claimed, was to increase the assessment levied on property-owners, who were legally assessable for laying the pavement, but not for maintaining or relaying it. The Supreme Court held that the contract was legal, and the case was taken to the upper court, where it was decided that this contention ignored the principle on which assessments for municipal improvements are levied in this state. Property-owners are not chargeable with the price of such improvements, but only with an equivalent for the special benefits they derive from the works. Such an equivalent cannot exceed the reasonable value of the improvement, and hence the municipality itself, not the assessable property-owners, must bear the excess of price beyond fair cost. If, therefore, the commissioners levying the assessment for this improvement were to charge to the property-owners anything beyond the fair cost of laying a good pavement, the court declared the assesment would be illegal to that extent. The same evidence offered in the suit to show that the nominal price for paving included compensation for the guaranty and repaving will then be available for the same purpose, and, if reproduced, will result in reducing the assessment to such a sum as would have secured a proper pavement without the added stipulations. The plaintiff's complaint, therefore, if well founded in fact, must, in the court's opinion, be reserved until the assessment is levied. This point being settled, the court saw no reason for denying the power of the municipal authorities to include in the same contract the three stipulations mentioned. The decision says: "The preparation and laying of asphaltum as a pavement requires special skill, and the quality of the pavement cannot well be ascertained by municipal authorities without the test of time. It is therefore reasonable that those who lay such pavement should submit it to this test in order to insure its goodness. And since the contractors who engage in this kind of work obtain their crude asphaltum from different sources, and subject it to various processes of preparation, there is a manifest fitness in providing that those who lay the original pavement should relay it whenever openings are made, so that uniformity of work and materials may be secured. It thus appears that the guaranty of durability and the stipulation for repaving are but incidents of the principal object of the bargain, dictated by prudence, and therefore rightly included with it in a single contract."

Salt Water for Street Sprinkling and Sewer Flushing.

The Merchants' Association of San Francisco, Cal., has submitted to the street committee of the board of supervisors a report treating upon the effects of fresh and salt water on bituminous pavements and the respective value of each for street sprinkling purposes. The conclusions reached were that neither fresh nor salt water had a harmful effect on bituminous rock pavement that was properly prepared and well laid, but from a sanitary point of view fresh water was inferior for street sprinkling. The committee will endeavor to effect a suitable arrangement with the Olympic Salt Water Company to procure a supply of salt water for flushing the sewers and sprinkling the streets.

Water Works Bookkeeping.

A recent number of the Bookkeeper contains an article upon "Water Works Accounting," by F. H. Macpherson, C. A., which describes the method of keeping the accounts of the water company with which he is now connected. Mr. Macpherson was called in by the company some time ago, after it had been discovered that serious loss had been sustained by reason of a defective system, coupled with loose methods of handling it. The scheme he then invented and put into operation is the one he describes in the article referred to.

Municipal Engineering Magazine a year or two since offered prizes for the best set of bookkeeping forms for the use of water companies. Mr. Macpherson was one of the many who responded to the call, and the blanks submitted by him (being the same which he describes in the Bookkeeper article) were deemed of so much merit that the committee unanimously awarded him one of the prizes. In his description of the Voucher Record, the most important book of the lot, after setting out in detail its various features, he adds:

"In the illustration the distribution is not nearly so complete as is desirable, but was framed to meet the requirements of the city years ago. If I were preparing a distribution page for a water works department at this time, I should make two general divisions under 'construction,' viz: (1) Distributing sytem, and (2) pumping system; and I should then collect the general expenses and fixed charges under a third head to be followed by a grand division of 'maintenance and repairs,' which would in turn be subdivided into 'pumping system' and 'distributing system,' while the latter of these would be again subdivided into 'street mains,' 'service connection,' 'meters,' and 'buildings and grounds.' All these would be still further divided to suit the requirements of the company or commission."

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It is evident that Mr. Macpherson had before him for reference the Voucher Record of the American Water Works Bookkeeping System, and it is interesting to note that in the words quoted he describes that book exactly and thus adds another name to the lost list of practical water works men who have found the system to be perfectly adapted to their needs. The American Water Works Standard system was made up by expert accountants after a careful study of the many good systems already in use and contains all the best and most desirable features of them all, condensed into an intelligent whole within much less compass than many others which are not nearly so comprehensive.

Manholes Without Drainage.

The discovery was recently made by Commissioner Moreland that some of the manholes in Detroit streets had no sewer connections and were filled with stagnant water that emitted foul odors. Further investigation disclosed that there were over a thousand such manholes. The commissioner cannot account for the failure to provide drainage for them, but says that the mistake must now be remedied for sanitary reasons, although the cost of the work will be very large.

Combination of Brick and Asphalt.

In the reconstruction of the asphalt pavement on Washington-st., the principal business thoroughfare of Indianapolis, brick have been used for the gutters and along the street railway tracks, with a 2-inch curb of stone between the brick and asphalt one foot outside the tracks. This form of construction relieves the asphalt from disturbance by vibration from the tracks, and the work has been done in a manner to give it a good appearance both along the tracks and in the gutters.

Road Building in Connecticut.

The Connecticut Valley Highway Association held its first field day at Blandford. Speeches were made in which the question discussed was how to assist country towns in building and maintaining good roads. W. L. Dickinson, president of the association, in a speech said not enough importance is given the road department in this country, advocate the building of costly roads, but believed that towns could adapt themselves to circumstances, and with a judicious handling of material good roads can be maintained; that the maintenance of a road was an art by itself. William Sessions, secretary of the state board of agriculture, said the country towns had not been treated justly, and suggested that, as a remedy, the small country towns unite in a movement to bring pressure upon the legislature to come to the assistance of such towns.

Opposed to Private Use of Public Property.

Commissioner Moreland of the Detroit Board of Public Works declares himself unyieldingly opposed to further grants allowing property-owners to build stairways on sidewalks, alleys or streets. He says that after these privileges are granted the property-owners feel that they own the space and will conform to no regulation of the city if avoidable. He believes anyhow that public property should not be given for private use, and says if he can have his way there will be no more of these stairways built in Detroit.

Difficulties Relating to Brooklyn's Water Supply.

Through its committee on legal proceedings the Brooklyn League is taking steps to bring an action to compel the comptroller to certify the contract with John McNamee for the 66-inch pipe line from Milburn to the old city line. The suit is a friendly one, for the comptroller and all of the other officials of the water supply department are in favor of the construction of the pipe line. The contract with McNamee was duly executed by the authorities last year, but Comptroller Palmer refused to certify it on the ground that if he did work all other improvements would be stopped. The constitution provides that water bonds shall not be reckoned in considering the city's debt limit, so that the comptroller's stand was something of a surprise. In an opinion dated March 5, Corporation Counsel Whalen quotes a section of the charter from which it might be concluded that the present comptroller has the power to certify the contract, and, if so, bonds might be quickly issued and work begun without delay. It was finally con-

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Buren, engineer of the department of water supply, reports that owing to insufficient conduit capicity five stations on Brooklyn's new water shed have been shut down for the past six months. The average daily supply of these five stations is 15,000,000 gallons, and, at the rate of $65 a million gallons, which the city is now paying a private company, the city is wasting daily water worth $975, for the reason that if the pumping station were in operation there would be no pipe line through which to bring the water to Brooklyn.

Program for Meeting of League of American Municipalities.

The program arranged for the meeting of the League of American Municipalities in Detroit, Aug. 1 to 4, provides for addresses of welcome at the opening session Monday morning by Governor Pingree and Mayor Maybury, and a response by President McVicar. The reports of officers are expected at the afternoon session on Monday, when there will also be a general discussion of garbage disposal, led by Dr. Kohnke of New Orleans and President Walker of the common council, Trenton, N. J. The topic at the evening session will be civil service, when the speakers will be Mayor Weaver of Louisville, Mayor Rose of Milwaukee and Mayor Kiefer of St. Paul, followed by an address on "The Relation of Municipalities to Organized Labor," by James A. Lavery, president of the Federation of Labor of New York.

At the Tuesday morning session the discussion will be on the question, "Boards, Single-Headed Commissions or Council Committees," led by Mayor Young of Akron, O.; Mayor Evans of Birmingham, Ala.; Councilman Collings of Holyoke, Mass., and Councilman Rand of Minneapolis. At the afternoon session the regulation of saloons will be discussed by Mayor Pratt of Minneapolis; Mayor Farnsworth of New Haven, Conn., and Mayor Perry of Grand Rapids, Mich. Street paving will be discussed by Mayor Saltsman of Erie, Pa., and Mayor Taggart of Indianapolis.

At the session Wednesday morning the subject will be "Remuneration to Cities for Franchise Rights In, Over and Under Public Streets and Alleys." The speakers will be Mayor Phelan of San Francisco, Mayor McMurray of Denver and Mayor Hoos of Jersey City. The afternoon will be occupied with entertainment by the local committee. In the evening there will be a discussion on municipal ownership by Mayors Jones of Toledo, Flower of New Orleans, Pierce of Marshalltown, Ia., and Johnson of Fargo, N. D.

At the Thursday morning session public water supplies will be discussed by Mayor McGuire of Syracuse, President Hillyer of the Atlanta water board and Mayor Levagood of Elyria, O. The election of officers and the selection of the next place of meeting are last on the program for Thursday afternoon. Among the entertainments arranged by the local committee are an afternoon at Belle Isle park, with refreshments, and a trip to Water Works park.

Technical Meetings.

At a meeting of the Western Association of Bridge Engineers, at Chicago, Ill., July 6, Oscar Sanne of Milwaukee read a paper on "Milwaukee Park Bridges," in which he gave a brief account of his work in designing the bridges in Lake park, Milwaukee.

The Connecticut Civil Engineers' and Surveyors' Association held its midsummer meeting at Bristol, Conn., July 7. The members visited the Bristol sewer farm and filter beds, and were taken over the line of the New Britain water works.

At a recent meeting of the Civil Engineers' Club of Cleveland, O., C. B. Stowe referred to the grinding of Portland cement, in which he said that in testing some foreign cements he found that about 60 per cent. would pass through a 200 mesh sieve and about 80 per cert. through 100 meshes. In making some tests recently to ascertain the point of fineness at which cement ceases to be cement and becomes practically sand, he found it to lie between the 200 and 400 mesh sizes. He found also that much depends upon the mixture of materials before burning, the strength being about in proportion to the amount of mixing when the fineness is 200. He had some clinkers from which a sand test would go higher than a neat one, and had found a cement might be so fine that it will crystallize in a neat test in such a way as not to carry the strength.

The New Bridge Over Niagara.

The new bridge which is being constructed across the Niagara at Niagara Falls will be the largest of its kind in the world. It will connect Queen Victoria Falls park on the Canadian side and the New York state reservation on the American side. The bridge will be a single structure, 1,268 feet long and a little over 49 feet wide. The main arch will be 868 feet long and will be reached from the Canadian side by an aproach 210 feet long, and from the New York side by an approach 190 feet long. In the middle 23 feet will be occupied by a double-track electric road, and on either side of this will

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be carriage ways 8 feet wide, and outside of these drives will be foot passages slightly elevated above the roadways. The notable part of the bridge is the absence of false works to sustain the main arch, which it was impossible to build owing to the peculiar formation of the land. High false works have been built, however, on either bank, which rise from the abutments to the flow of the old suspension bridge, which has been left in place to aid the work of building the new structure. This false work extends, also, on either side from the abutments over the slopes of the banks to the cliffs, and on this the shore spans or approaches will be built. There are four abutments, two on either side of the river, standing about sixty-seven feet apart. On each of the four abutments the bed plates were fastened for anchorage of the arch. The workmen, operating from the old suspension bridge, first placed the top cords in position; the end posts were then built and the structure began spreading out from either band. Peculiar methods were adopted where the two sections met and were joined. Long ladders were let down from the old suspension bridge to afford the men facilities for reaching their work, and anchorages were sent down to the two sections from the top cord of the approaches in others to support their weight. The men are described as being "like spiders in a steel web, suspended 150 feet above the boiling water of the gorge." In order to give the workmen every protection possible during their perilous work, a boat manned by an expert oarsman was kept under the bridge. The bridge is the fourth one erected on this site. The first one was a wooden structure ten feet wide, built in 1869. It was rebuilt in steel in 1888, which in 1889 was swept from its cables by a hurricane. This was rebuilt and was in service for ten years.

Trouble Over Cutting Into a New Pavement.

A perplexing question has been brought before the board of public works of Los Angeles, Cal., as to whether or not the Los Angeles Lighting company should be permitted to tear up the new surfacing of Main-st., from First to Fourth, in order to put in its conduits. The contract for the city to have its wires underground and overhead wires removed. When the Los Angeles company learned, however, that the San Gabriel company would be a formidable competitor for city lighting the conduit agreement was at an end, and the lighting company was compelled to put in its own underground duct. The contractors were unable, however, to get the conduits in before the pavement was laid, although all the other companies got their wires underground promptly. The lighting company was ordered not to tear up the new paving. Petitions of protest have been laid before the council, which body has referred them to the board of public works, in which the property-owners along the street declare they will do everything in their power to prevent the tearing up of the new pavement, and if the company persists in tearing it up they will withdraw their patronage.

The lighting company, through its representatives, has assured the property-owners and the board that it is perfectly willing to do anything practicable and satisfactory to all concerned, and has under consideration a number of plans which tend to enable it to get out of the difficulty. The board of public works is also worried over the refusal of some of the property-owners along the recent street improvements from First to Ninth-sts., to pay their respective shares of the improvement until the council formally accepts the street and thereby makes the city responsible for its repair in the future. The council has never accepted but one small piece of street improvement in the city and it hesitates to establish a precedent now on account of such an action necessitating an additional tax levy to provide for keeping up repairs. Judge Gottschalk argues that the law requires the council to accept such improvements, and as it will eventually be driven to it, the council might as well begin now. The board has taken the matter under advisement.

Corporate Seal on Mortgages Not Required.

A decision was rendered by Judge McCarty in common pleas court regarding mortgages executed on the plant of the Standard Paving company, but in which a corporate seal was not used. The mort-

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New Publications.

Vegetation and Scenery in the Metropolitan Reservations of Boston. By Charles Eliot. Published by Olmsted Brothers, Boston.

This is the last report written by Charles Eliot on the Metropolitan Reservations around Boston. It is an interesting record of the condition of the reservations and a valuable treatise on the methods of controlling and changing the vegetation for the improvement of the scenery. The principles are applicable to other situations and the treatise will therefore be appreciated by all who are interested in landscape work. The text is supplemented with a large number of fine half-tone illustrations of park scenery, several tinted nigrosine prints and maps of Stony Brook reservation, Middlesex Fells and Blue Hills. The book has been published at the expense of a member of the Metropolitan park commission under the supervision of Messrs. F. L. and J. C. Olmsted, the landscape architects who were associated with Mr. Eliot.

Lighting by Acetylene. By William E. Gibbs, M. E. Published by D. Van Nostrand, New York. Price, $1.50.

In this book Mr. Gibbs gives timely information on the practical questions relating to methods of lighting by acetylene, which promise to grow rapidly in importance. It is the aim of Mr. Gibbs to aid this progress. In his digest of present knowledge of the subject he has drawn freely from the French, who have been quick to perceive and develop possibilities of the new processes. Although the patenting of new generators is now proceeding at the rate of two or three a week Mr. Gibbs says that these may all be divided into three classes, and that any new machine can differ from the existing forms only in matters of detail. It is merely necessary to bring calcic carbide into contact with water in some kind of vessel to produce acetylene gas. The generation is a simple matter, but the difficulties lie in devising the means of supply. While he thinks that the ideal machine has certainly not yet been invented, the safe, efficient and cheap lighting of houses by acetylene he regards as already an accomplished fact.

A Text Book on Roofs and Bridges. Part IV. Higher Structures. By Mansfield Merriman and Henry S. Jacoby. Publishers, John Wiley & Sons, New York. Price, $2.50.

Profs. Merriman and Jacoby have given the public a valuable series of text books on structural work, and the three preceding volumes from them have logically led up to this treatise of the more difficult problems of continuous, draw and cantilever bridges with more than two supports, as well as the suspension and arched bridges which have two supports whose reactions are not vertical. The theory of stresses and their determination by analytic or graphic methods are considered. The continuous girder is treated sufficiently to develop the necessary formula for swing bridges. Partially continuous swing bridges are discussed fully and an exact method is given for finding the true reactions and stresses. Cantilever and suspension structures are quite thoroughly treated and critical analyses are given regarding the limitations of the theory and economic properties. Arches are treated in detail under different headings and the stresses for several cases are derived by simple graphic constructions. The authors have succeeded in making their presentation concise and clear, and have produced a work of great practical value.

Personal.

James R. Lawrence has been elected city engineer of Greenville, S. C.

O. H. P. Belmont has been appointed park commissioner at Newport, R. I.

George Crisp has been elected manager of the water works at Elyria, O.

Paul Dato has been elected superintendent of the water works at Dallas, Tex.

A. B. Little has been elected borough engineer and surveyor at Ridgway, Pa.

F. P. Brevier has been appointed superintendent of water works at Mobile, Ala.

S. Edward Bates has been appointed assistant city engineer at Richmond, Va.

M. M. Downer has been elected president of the board of public works at Bridgeport, Conn.

Cecil Fraser has been re-elected engineer of the board of park commissioners at Louisville, Ky.

Harry T. Litchfield has been appointed superintendent of the electric light plant at Lilly Dale, N. Y.

Henry Amerige, formerly superintendent of streets at Malden, Mass., died July 14, aged eighty years.

The Hon. Eliada S. Merrill, president of the board of water commissioners, Lowville, N. Y., died July 4.

Charles E. Ellis, ex-city engineer of Kansas City, Kas., was drowned July 5 while fishing near Noel, Mo.

Dr. Nicholas H. Freeland has been elected president of the board of water commissioners at Tarrytown, N. Y.

R. P. Bower, city engineer at Champaign, Ill., has been appointed a second lieutenant in the United States army.

Alfred J. Murphy has been confirmed as park commissioner at Detroit, Mich., to succeed Dr. B. R. Hoyt, resigned.

John DeN. Christie, C. E., who was road engineer of Rockland county, New York, died July 2 at Haverstraw, N. Y.

Bernice Nelson, street commissioner at Granville, N. Y., was killed July 10 by the caving of the banks of an excavation in which he was supervising repairs on a water pipe.

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Frank H. Hamilton, Springfield, Ill., has declined a lieutenancy in the army, and will resume his position as city engineer.

Dr. Charles Mason has been appointed water commissioner at Peekskill, N. Y., to succeed William Brotherton, resigned.

James D. Schuyler, M. Am. Soc. C. E., has been engaged as consulting engineer on the construction of the proposed concrete dam.

Engineer Millaney of Sing Sing, N. Y., has been appointed superintendent of the Croton water shed for the section about Mt. Kisco, N. Y.

F. B. Roziene, C. E., of Charles City, Ia., is company commander in the Forty-ninth regiment of Iowa volunteers, stationed at Tampa, Fla.

Gavin Nelson Houston, Jun. Am. Soc. C. E., formerly assistant engineer, has been appointed superintendent of water works at Nyack, N. Y.

Col. Francis G. Ward, superintendent of the bureau of water at Buffalo, N. Y., has been granted leave of absence to enable him to enter the army.

Col. John Atkinson has resigned from the public lighting commission of Detroit. Mayor Maybury has nominated David W. Simons for the vacancy.

Richard Weightman has been appointed a member of the Rock Creek Park commission, Washington, D. C., to succeed R. Ross Perry, who resigned.

C. H. Campbell has resigned his position as mayor of Ocala, Fla., and has been engaged as a manager of the water works system at Charlotte, N. C.

Charles A. Myers has resigned his position as engineer of sewer construction in the borough of Brooklyn, New York City, and will resume private practice.

In the list of newly elected city engineers published in the July number appeared "John Sibert, Peoria, Ill." This was an error. The city of Peoria will have trouble in finding a better engineer than it has at present, Mr. A. D. Thompson.

Robert G. Smith, a member of the street and water board at Jersey City, N. J., has gone to the front as colonel of the Fourth regiment of New Jersey volunteers.

John W. Hill, M. Am. Soc. C. E., Cincinnati, O., has been engaged by the city of Indianapolis as expert adviser in the proposed purchase of the Indianapolis water works.

E. A. Sawyer has been elected city engineer at Colorado Springs, Col., and N. W. Wall, formerly city engineer of Trinidad, Col., has been appointed assistant city engineer.

Harrison Souder, who for some time has been principal assistant to Carl A. Trik, late superintendent of bridges at Philadelphia, Pa., is acting superintendent since Mr. Trik's death.

Charles A. Hague, M. Am. Soc. C. E., New York City, has been engaged by the water commissioners of Bradford, Pa., to assist W. P. Winfree, city engineer, to make plans for a new reservoir.

Gen. Roy Stone's force of 600 laborers left Charleston July 26 for Porto Rico. Gen. Stone will have charge of the road and pontoon bridge building in Porto Rico during its occupation by the United States troops.

N. C. Grover has been appointed professor of civil engineering in the University of Maine, at Orono, Me. C. P. Weston has been appointed instructor in civil engineering and Ralph Hamilton assistant in civil engineering.

Frederick J. Mills, C. E., state engineer of Idaho, has been commissioned first lieutenant in the Second regiment of United States volunteer engineers. Paul C. Sellman has been appointed to succeed him as state engineer.

MACHINERY AND TRADE.

Recent Inventions.

(Reported specially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for 10 cents.)

605,985—June 21, 1898.—Apparatus for Filtering or Purifying and Aerating Water—J. A. Weidersheim, Philadelphia, Pa. The water is fed upward through a filter bed and caused to overflow a series of terraces into a receiver.

606,216—June 28, 1898.—Grading and Ditching Machine—C. F. Hinman, Chicago, Ill. A machine provided with a plow delivering to one side and provided with many improvements in details of construction and arrangement of parts.

606,453—June 28, 1898.—Filtering Apparatus.—G. G. Fryer, Syracuse, N. Y., assignor to the Solvay Process company, same place. A cylindrical filtering body, which has a perforated filtering surface and over this is secured an endless facing, which is provided with perforations of less size than the perforations of the filtering surface.

606,987—July 5, 1898.—Ditching Machine.—J. H. Clark, Chicago, Ill., assignor to F. C. Austin, same place. The cutting in accom-

brush. The box is supported on suitable wheels and the brush is rotated by means of an oscillating handle, which is moved by the operator.

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elevator may be adjusted to any desired position.

607,426—July 19, 1898.—Pumping Sewage by Bacterial Action.—W. M. Ducat, London, England. The sewage is caused to flow in a thin stream over a filter bed, which is so inclosed that the flow of the sewage will suck in fresh air through openings provided in the setting for that purpose. The claims cover both the process and the apparatus.

607,553—July 19, 1898.—Garbage Furnace.—I. D. Smead, Toledo, O., assignor to Smead Cremating and Power company, same place. This furnace consists of a tall stack, in the lower end of which is mounted a grate. Leading to this grate from the under side is a feed chute through which the garbage is forced from a suitable hopper by a plunger. Mounted above the grate, within the stack, is a tubular boiler.

607,688—July 19, 1898.—Ditching Machine.—J. W. Humphreys, Iroquois, Ill.

Value of Municipal Engineering as an Advertising Medium.

The Keystone Crusher and Roller company, Pittsburg, Pa., has sold a reversible road roller at Mt. Vernon, Wash., regarding which Mr. John W. Meehan, C. E., of Mt. Vernon, writes: "You can credit this sale to the discussion in Municipal Engineering last September." Mr. C. F. Hinman, secretary of the Keystone Crusher and Roller company, writes under date of July 1: "We are pleased to acknowledge the value of your magazine as an advertiser."

The Portland Cement Trade in the United States.

The condition of the cement industry in this country is very active. The cement mills now in operation in this country have found the greatest drawback in not having sufficient cement to supply the demand. The eastern mills in the past five years have always run short of cement to fill their contracts in the early spring.

The production of Portland cement in the United States during the year 1896 amounted to 1,543,023 barrels, as compared with 920,324 barrels in 1895, an increase of 522,699 barrels or nearly 56 per cent., which sold at an average price of $1.50 per barrel, in bulk, at the mill, this extraordinary increase taking place largely in the Lehigh regions. In 1896 there were twenty-six mills in operation in the United States and the imports of Portland cement for the same period were 2,989,597 barrels, a slight decrease over that of the preceding year. The amount of cement imported for the last six years has been remarkably uniform; the total for 1896 being almost exactly equal to that of 1891, the percentage of total consumption having grown from 3,443,126 barrels to 4,447,134 barrels in 1896, an increase in five years of over 1,000,000 barrels, notwithstanding this being a period of general business depression.

In the United States at the beginning of the year 1897 there were eighteen factories manufacturing cement from limestone or rock, and producing 1,203,234 barrels; eight factories using marl and producing 334,789 barrels.

The estimated production of Portland cement in the United States for 1897 was 2,304,300 barrels. The imports of Portland cement into the United States for 1897 were approximately, 2,255,810 barrels, showing that there is room for a large increase in the American cement industry. In addition to this there was produced in the United States in 1897 about 7,970,450 barrels of natural or Rosendale cement, a production of sixty-seven factories.

The growth of the consumption of cement given by periods of ten years is as follows:

Year.	Pounds per capita.
1850	6.46
1860	10.49
1870	12.77
1880	13.04
1890	33.93

These tables show a remarkable increase in the last ten years. Between 1880 and 1890 the increase in consumption was almost 200 per cent. over 1880.

The average price at which the natural rock cement was sold in 1897 in bulk at the mill, not including cost of packages, was 50.8 cents per barrel.

As it is universally admitted by engineers that one barrel of Portland cement is equal to two of natural, and in many cases to three, it can readily be seen that as soon as Portland cement is sold at $1.00 at the mill in bulk natural cement manufacturers will be forced to the wall and 4,000,000 barrels per year additional of Portland cement could be used. This is without taking into consideration the steady growth of the consumption of cement, which, as we have stated above, was almost 200 per cent. between 1880 and 1890. But supposing even the impossible condition that the cement consumption should not increase, there would be ample market to take up any increased production that may take place in the next ten years. Taking importations at 3,000,000 barrels and the natural rock production at the rate of one barrel of Portland to two of

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natural, would make 7,000,000 barrels to be consumed in this country, in addition to what the mills can already supply, or an increase in the daily production of about 23,000 barrels over the present daily production of about 5,300 barrels.

The very notable shortage of last fall has extended to this spring's trade and all of the eastern mills have already contracted for their production at prices ranging from $1.40 to $1.65 per barrel, in bulk, at the mill. The daily consumption of Portland cement in the United States in 1897 was about 16,000 barrels. Assuming the consumption of Portland cement will continue to increase in the same ratio as in the past ten years the American manufacturers will still have to displace 3,000,000 barrels of imported cement. —"Observer" in Cement and Engineering News.

Trade Notes.

The Cassadaga Cement Works at Cassadaga, N. Y., will be enlarged.

Z. C. Wise has been appointed receiver of the Holloway Brick Paving Co.

The Castalia Portland Cement works, Castalia, O., have commenced operations.

The Newport Cement Co., near Evansville, Pa., will be put in operation soon.

The Michigan Portland Cement company has been incorporated at Detroit, Mich.

The James G. Crispin Lime and Cement Co., Cincinnati, O., has been incorporated.

The Coldwater Portland Cement Co., Coldwater, Mich., will be in operation by Sept. 1.

The Alcatraz Asphalt Co. has built a refinery at Sisquoc and in the town of Alcatraz, Cal.

The new plant of the Davis Portland Cement company at Middlebranch, O., is about completed.

The city council of Amboy, Ill., at its meeting, July 18, orderel the purchase of a stone crusher.

The Independence Vitrified Brick Co., Independence, Kas., is reported as having resumed operations.

The Occoquan company, Occoquan, Va., has been incorporated to purchase and operate stone quarries, etc. John L. Mayer, prest.

W. P. Rice and a number of capitalists of Dayton, O., are building a cement factory near Rushsylvania.

S. G. Higgins has placed on exhibition in Saginaw paving brick manufactured by the Saginaw Clay Mfg. Co.

Hetherington & Berner are constructing a portable asphalt plant for the Western Paving and Supply company.

The establishment of a paving brick plant at Reed's Lake, Grand Rapids, Mich., is contemplated by Jacob G. Tuttle.

The Bonneville Cement company, Siegfrieds Bridge, Pa., has leased a hundred acre farm

It is the intention of J. C. Adams of Indianapolis, Ind., to manufacture paving brick at his plant at Martinsville, Ind.

The Coffeyville Vitrified Brick company, Coffeyville, Kas., has in contemplation the establishment of a plant at Cherryvale.

The plant of the Siegfrieds' Mfg. Co., builders of cement machinery, at Siegfrieds' Bridge, Pa., was destroyed by fire, June 8.

Philip Kennedy of Scranton and C. W. Etting of Philadelphia will erect a large paving and building brick plant at Exeter, Pa.

The Pacific Flush Tank Co., Chicago, Ill., has removed its Canadian agency from Toronto to Niagara Falls, Ont. Victor Hill, manager.

The Austin Portland Cement Co., Austin, Tex., has been incorporated to manufacture cement by E. G. Stolley, A. T. Rose and S. Silverman.

The Buckhorn Portland Cement company, Cumberland, Pa., has purchased a 1,000-acre tract of land just went of Oakland and will establish a plant.

A large deposit of marl has been discovered on the farm of C. W. Hartt, at Pierson, Mich. Press reports state that it would be well for parties interested in the cement business to investigate.

An iron sewer and water pipe manufacturing plant is to be erected on the lake at the terminus of the Calumet canal, at Chicago, by Pittsburg capitalists.

W. J. Gilfillan and C. G. Hemenway will try to interest local capital in property belonging to them in Moline, Ill., with a view to establishing a paving brick plant.

The Austin Portland Cement Manufacturing company, Austin, Tex., has been incorporated to manufacture cement, etc., by E. G. Stolley, A. T. Rose and S. Silverman.

The Keystone Cement company, borough of Brooklyn, N. Y., has been incorporated with William C. Owen, John Kamelia and William H. Harris of that city as directors.

The Chicago Cement company is said to have completed arrangements for building a plant at LaSalle, Ill. Davis R. Fraser, Norman Fraser and Ralph Bates, incorporators.

The Mankato Cement Works, Mankato, Minn., has, according to press reports, been transferred from Louis M. Fulton of New York to Atwood Collins of Hartford, Conn., as trustee for the first mortgage bondholders.

The Hudson River Paving Brick company will begin operations at once on recently acquired property of Fred H. Jones and the Hudson River Iron company at Hudson, N. Y.

The W. S. Dickey Clay Mfg. Co. of Kansas City, Mo., secured a contract for furnishing 300 car loads of sewer pipe for a sewerage system in Guadalajara, Mexico, for about $80,000.

The Western Lime company has been incorporated at Indianapolis, Ind., to manufacture lime and cement, with headquarters in Lawrence county, Indiana, and Cook county, Illinois.

Recent press reports state that owners of blast furnaces in Cleveland, O., may follow the example of the Illinois Steel company

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The Portland Cement Works at Union City, Mich., has been purchased by an English syndicate, and the capacity of the plant will be increased to 1,000 barrels. The price paid for the plant is said to be $600,000.

The W. S. Dickey Clay Mfg. Co., Kansas City, Mo., has opened its new works for sewer and culvert pipe manufacture, at Deepwater, Mo. This plant was built to replace the one destroyed by fire in August, 1897.

The large quantity of Portland cement which is being furnished the government for use in coast defenses and fortifications in various parts of the United States, has resulted in a scarcity of that article for other purposes.

Becoming dissatisfied with the allotments, six mills of the Western Cement Association, Jeffersonville, Ind., have withdrawn. The mills withdrawing are the Haussdale, Eagle, Clark County, United States, Ohio Valley and Sheen's.

The Vulcanite Portland Cement company at Vulcanite Station, on the New Jersey Central railroad, near Phillipsburg, N. J., has awarded contracts to H. L. Foote & Co. for the erection of six additional buildings for its plant.

The Pridham Sewerage Utility company, Newark, N. J., has been incorporated to treat and deodorize all kinds of sewage, by Samuel S. Pridham, Paul Buchanan and Ludwig F. Mergott of Newark and John Whitehead of Morristown, N. J.

The Acme Portland Cement company, Camden, N. J., has been incorporated to manufacture cement of all kinds. The incorporators are: T. H. Wheeler, Orange, N. J.; William M. McKelvy, John Marshall Lockhart and Charles E. Pape, Pittsburg, Pa.

The Santa Maria Asphalt company of Santa Barbara, Cal., has secured a contract from Charles B. Rhodes of Denver, Col., for 250 tons of crude asphalt, first grade, at $10 per ton; 500 tons crude, second grade, $8 per ton; 1,000 tons refined, containing 70 per cent. in bitumen, $15 per ton.

The Birmingham Pipe Works, Birmingham, Ala., have been sold according to a decree of the chancery court to Theodore Ahrens, jr., general manager of the Ahrens & Ott company of Louisville, Ky. The works were built several years ago by H. T. Beggs and associates, who manufactured from 2 to 8-inch cast iron solid pipe and fittings for the same. The plant will, in all probability, be enlarged and operated by the new owner.

Plans are being devised for the erection of a cement factory at White Pigeon, Mich. The directors have elected officers as follows: President, William H. Coulter, Frankfort, Ind.; vice-president, H. G. Watson; secretary, Den C. Thompson, Cleveland, O.; treasurer, T. E. Clapp.

A cement mill is being erected at Falling Springs, Mo., about eight miles below East St. Louis, Ill., which promises to be one of the largest of its kind in the West. The deposit is hydraulic limestone, from which natural cement is made. A number of St. Louis capitalists are interested in the movement, including E. G. Heim of St. Louis.

The Buffalo Cement Co., Ltd., Buffalo, N. Y., has been incorporated to manufacture natural and Portland cement. The officers of the company are: President, Lewis J. Bennett; vice-president and treasurer, Jas. J. Wood; secretary, Leslie J. Bennett. The company began the manufacture of natural hydraulic cement at Williamsville in 1824.

A brochure has been issued by the City Street Improvement company of San Francisco, which gives a number of half tone views of California bitumen deposits, showing how the material is mined and how streets are paved with it. The text gives much information regarding the qualities and uses of bitumen in comparison with asphalt. This company, according to its published record, has constructed 5,270,708 square feet of bituminous pavement, 1,354,757 square feet of basalt block, 907,169 square feet of macadam and 91,512 square feet of cobble pavement and 31,530 lineal feet of sewers, besides electric railways and harbor breakwaters. The book contains many testimonials regarding the character of the company's work.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Joliet, Ill.—Asphalt paving is being advocated by C. S. Witner of the Joliet Manufacturing company.

Kalamazoo, Mich.—A block of macadam paving is being constructed on E. Water-st. as an experiment.

Maryville, Mo.—A good roads organization has been effected in this city, and a Good Roads day will be held about the middle of August.

Milwaukee, Wis.—The repeal of the perm- in force until a new set has been agreed upon by the aldermen and the board. The board of public works accepted two of the amendments—one requiring a ten-year guarantee for asphalt pavements, and the other filler for cedar block pavements.

Cortland, N. Y.—The recent warm weather has caused the brick pavement in Railroad-st., particularly at the Church-st. corner, to expand to such an extent that the entire northern half of the pavement is raised fully six inches from the cushion on which it rested.

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than twenty-five streets in this borough, and aggregating more than sixteen miles in length, not a single bid was received. It was claimed that the asphalt companies sent their bids, but withdrew them at the last moment.

The citizens of Arkansas will vote on the question of securing an amendment to their constitution which will permit local option in road improvements. If the electors in any county vote in favor of a public road tax at the general election for state and county officers, then the county court shall have the power to levy, in addition to the county tax, an amount not exceeding 3 mills on the dollar on all taxable property as a "county road tax," to be used exclusively for building and repairing roads and bridges of the county.

Washington, D. C.—The District appropriation bill includes appropriations for municipal support and improvements during the fiscal year, ending June 30, 1899, as follows: Grading, extending and paving streets, $475,350.93; sewer work, $15,000; repairing sidewalks, $15,000; repairs to county roads, $60,000; street cleaning, $145,000, of which $18,000 will be for hand cleaning, and a strict account will be kept in order to determine the relative expense of hand-sweeping by day labor and under contract; park commissioners' contingent expenses, $22,500; lighting, $166,000, of which $1,000 is to be expended in experiments with new lamps; investigating the feasibility of filtering the water supply of Washington, $300; resuming work on the Washington aqueduct canal and the Howard University reservoir, $927,210.50.

CONTEMPLATED WORK.

Danville, Ill.—Brick or asphalt paving is contemplated.

Berlin, Wis.—Macadamizing is proposed for Huron-st.

Lowell, Mass.—Smooth paving is contemplated for one street.

Ravenna, O.—An ordinance has been passed to pave Main-st. with brick.

Ashland, Pa.—Brick paving is contemplated for a number of streets and avenues.

Fargo, N. D.—The city council has decided to pave fifty-one blocks of streets.

Watertown, Wis.—A portion of Main-st. will be paved. Harlow Pease, mem. B. P. W.

Kingston, N. Y.—Plans and specifications have been prepared for asphalt paving.

Oshkosh, Wis.—Macadam paving is proposed for seven streets. A. B. Ideson, mayor.

Marquette, Mich.—The council contemplates macadamizing Beeber-ave. and Palms-st.

Kalamazoo, Mich.—Brick paving on concrete foundation is contemplated for E. Main-st.

Paterson, N. J.—The question of asphalt paving is reported as being under consideration.

West Hoboken, N. J.—Plans and specifications have been approved for paving Clinton-ave. with asphalt.

Windsor, Ont.—The cost of paving Second-ave. with asphalt is estimated at $25,750 by City Engineer Ludden.

Springfield, Ill.—An amended ordinance was passed July 18 for paving Washington-st., from First to Mill-st.

Hamilton, O.—Preliminary steps have been taken toward paving Second-st., from Central-ave. to Black-st.

Leavenworth, Kas.—The question of street paving is being urged for consideration. Brick or asphalt is suggested.

Des Moines, Ia.—An ordinance has been passed to construct 10,000 sq. yds. of block paving. Geo. M. King, cy. engr.

Hartford, Conn.—A petition has been presented to council for asphalt paving on Ann-st., from Asylum to Allyn.

Shamokin, Pa.—The council will give a hearing Aug. 23 to vote on the question of borrowing $65,000 for paving.

Philadelphia, Pa.—Asphalt paving is contemplated for Lehigh-ave., from Richmond-st. to Kensington-ave.

Kewanee, Ill.—Brick and cement sidewalks will be constructed in a large number of streets to replace the board walks.

Newark, N. J.—Notice of intention has been recommended for repaving the lower portion of Spruce-st. with asphalt.

Lorain, O.—The question of paving Second-ave., from Broadway to Washington, with asphalt or brick is being considered.

Brazil, Ind.—The gravel road election in Sugar Ridge township carried. About fifteen miles of roads will be built.

Rockford, Ill.—A resolution has been passed to pave Walnut-st., from S. Madison to Water, with brick and curb with stone.

Albany, N. Y.—An ordinance was passed July 18 to repave Elm-st., from Grand to Delaware-ave., with vitrified brick.

Portchester, N. Y.—About 16,000 sq. yds. of Main-st. and Westchester-ave. will be paved with brick. J. A. Kirby, engr.

New Rochelle, N. Y.—Estimates have been filed by the street committee amounting to $125,000 for paving and macadamizing.

Saginaw, Mich.—A resolution was adopted July 15 to pave Court-st., from Michigan-ave. to the Bay City state road.

Brooklyn, N. Y.—The property-owners on Livingston-st. have petitioned for asphalt paving from Boerum-place to Nevins-st.

Jackson, Mich.—The question of paving W. Main-st. and Wildwood-ave. has not yet been settled. Alderman Carroll, chairman street committee.

Nanticoke, Pa.—An ordinance has been passed to pave portions of Main and Market-sts. with brick. William T. Mahon, president council.

Elgin, Ill.—The question of constructing 18,000 sq. yds. of brick or asphalt paving is being considered. Adin Mann, city engineer.

Danville, Ky.—The city council has ordered the residents to construct about 5,000 ft. of brick sidewalks with stone curbing.

Chester, Pa.—An ordinance for paving

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to Twenty-fourth. The ordinance has been passed.

Birmingham, Ala.—The Commercial club has petitioned the county commissioners to construct a boulevard on the north side of Red mountain.

Troy, O.—A resolution has been passed to grade, curb, gutter and construct culverts and drains on the Clay-st. extension, from Mulberry to Walnut-st.

Philadelphia, Pa.—Resolutions have been passed for paving portions of three streets with asphalt and eight streets with brick. Chas. F. Warwick, mayor.

Philadelphia, Pa.—The question of paving Lehigh-ave., east of Kensington, is being agitated. The street is paved with Belgian block as far east as Kensington-ave.

San Francisco, Cal.—The residents of Richmond have petitioned for a special appropriation of $55,000 with which to pave Point Lobos-ave., between First and Central-aves.

St. Louis, Mo.—Asphalt paving is proposed for Grand-ave., from Laclede to Easton; Washington-ave., Chestnut and Morgan-sts., from Grand to Jefferson and Lucas-ave., from Grand to Beaumont.

Columbus, O.—A resolution was adopted July 11 for paving with asphalt, stone block or any other manufactured block or brick, Yale-ave., from Broad to State-st. John T. Barr, cy. clerk.

Long Island City, N. Y.—The board of estimate and apportionment has decided to expend $50,000 for laying asphalt strips in Thirty-fourth and Ninety-second-st. ferries on Jackson and Thompson-aves.

Milwaukee, Wis.—That part of Newberry boulevard not already paved will be paved with asphalt, and Wisconsin-st., between Marshall-st. and the N. W. station railway, will be paved with brick.

Lincoln, Neb.—The property-owners on O-st. will petition for asphalt paving. The city engineer was instructed, July 18, to make estimates of the cost of repaving district No. 1 with brick and asphalt.

Minneapolis, Minn.—Brick paving has been recommended for Twelfth-st., N., between Hawthorne and First-ave., N. Sandstone paving has been recommended to replace the planking on Bridge-square, over the Great Northern tracks.

Kansas City, Mo.—The property-owners on Prospect-ave. are urging the use of brick in paving between the tracks of the Met. St. Railway Co. The street is to be paved with asphalt, but owing to the fact that asphalt has never been used between the rails in this city there is some objection to its being put down now.

Bellefontaine, O.—Resolutions have been passed for paving Court-ave., from Opera to Mad River-st., with brick; improving Main-st., from Chillicothe-ave. to West's addition, by curbing with stone or cement, constructing a brick gutter, with necessary drains and sewer inlets; establishing grades on Auburn-ave. and Main and Hamilton-sts. W. J. Nichols, cy. clk.

CONTRACTS TO BE LET.

Omaha, Neb.—Bids are asked until Aug. 15 for about 35,000 cu. yds. of grading. D. M. Haverly, co. clk.

Lancaster, O.—Sealed proposals will be received until Aug. 13 for paving Central Main-st., from Broad to Maple, with brick. H. T. Mechling, cy. clk.

Fremont, O.—Bids are asked until Aug. 15 for brick paving. Russ J. Christy, chrmn. imp. com.

Anderson, Ind.—Bids will be received Aug. 8 for 18,000 sq. yds. of brick paving. H. H. Rogers, cy. engr.

Mansfield, O.—Bids are asked until Aug. 6 for improving Hedges-st., from Park to Home-ave. F. M. Remy, cy. clk.

Orrville, O.—Bids are asked until Aug. 9 for material and work for improving Market-st. E. Wirth, cy. clk.

Boise City, Idaho.—Bids will be received until Aug. 4 for the construction of stone crossings across seventeen streets. Dean Perkins, cy. clk.

Anaconda, Mont.—Bids will be received until Aug. 2 for constructing a road 12.1 miles long. M. Martin, co. clk.

Marion, Ind.—Sealed bids will be received until Aug. 2 for improving an alley and for constructing sidewalks in Lincoln and Thirty-first-sts. John Watts, cy. clk.

Huntington, Ind.—Sealed proposals will be received until Aug. 9 for grading, curbing and graveling Canal-st., from Lafountaine to Oak-st. Frank Guthrie, Cy. C. E.

Vernon, Ind.—Sealed bids will be received until Aug. 12 for constructing 99,340 mls. of pike road in Vernon twp., and 16.83 mls. and 44.6 feet in Geneva twp. Henry Hinchman, co. audt.

Toledo, O.—Sealed proposals will be received until Aug. 8 for paving an alley with vitrified or granite block, on concrete foundation, and curbing. Lem P. Harris, cy. clk.

Chillicothe, O.—Sealed bids will be received until Aug. 13 for paving Paint, Second and North and South Market-sts. with vitrified brick or block, with curbing, gutters, etc. W. J. Eyth, cy. clk.

Cedar Falls, Ia.—Sealed proposals will be received until Aug. 2 for 29,000 sq. yds. of brick pavement on macadam foundation, 9,000 cu. yds. excavation and 8,000 lin. ft. cement curbing. D. M. Rosser, engr.

Brooklyn, N. Y.—Bids are again asked for repaving and maintaining about fifty asphalt streets. While the form of advertisement has not been changed, it is believed that there might be different conditions.

Fremont, O.—Sealed proposals will be received until Aug. 15 for paving with brick, curbing, etc., Hayes-ave., from Front-st. to Buckland ave., and for curbing, macadamizing and graveling Napoleon-st. C. F. Bell, cy. clk.

Louisville, Ky.—Bids will be received until Aug. 5 for asphalt paving in Oak and Twenty-sixth-sts. Bids were received for this work July 23, but were rejected as being too high. Chrmn. Grainger of B. P. W.

New York City.—Bids are asked until Aug. 2 for 100,000 gals. paving cement. Also for repairing and maintaining, asphalt pavements and furnishing broken stone and limestone screenings in the borough of Brooklyn. Jas. P. Keating, comr. highways.

Lafayette, Ind.—(Special.)—W. K. Eldridge, cy. engr., says bids will be received Aug. 22 for paving certain streets with asphalt. Sealed proposals will also be received Aug. 8 for constructing cement sidewalks in a large number of streets. Thos. W. Burt, cy. clk.

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Kewanee, Ill.—Sealed bids will be received until Aug. 2 for constructing brick paving on a concrete base on Tremont-st., consisting of the following: Excavation, 9,000 cu. yds.; paving, 20,240 sq. yds.; curbing, 8,266 lin. ft. J. H. Pierce, prest. B. of L. I.; J. C. Quade, cy. engr.

Newark, N. J.—Sealed proposals will be received until Aug. 4 for paving with asphalt on concrete, curbing, etc., portions of Elm, Charlton, Garside, Beaver and Livingston-sts. and for 3,800 sq. yds. of oblong granite block paving on concrete on Pacific-st. M. F. M'Laughlin, Gen'l Supt. Works.

Cincinnati, O.—Sealed proposals will be received until Aug. 2 for macadamizing, curbing, flagging, etc., Western-ave. Proposals will be received until Aug. 3, for paving Bates-ave., from Coleran to Spring Grove-ave. with asphalt. A. P. Butterfield, clk. bd. cy. affairs.

Cleveland, O.—Sealed proposals will be received until Aug. 19 for constructing the embankments, paving, curbing and flagging the approaches to the Martin-Praha bridge. Geo. R. Warden, dir. pub. wks. Bids will be received until Aug. 3 for constructing stone masonry in section 8 of Rockefeller Park. C. W. Pratt, jr., ch. engr. park comrs.

Columbus, O.—Sealed proposals will be received until Aug. 3 for the following: Asphalt, stone block, manufactured block or brick, or macadam paving on W. Park-ave. and State-st.; brick, block, macadam or other substantial paving on Harris-ave., from Broad to Grace-st.; grading and paving gutters and curbing Gay-st. Jas. A. Fanning, clk. B. P. W.

Cincinnati, O.—Sealed proposals will be received until Aug. 8 for keeping in repair for a period of five years a large number of asphalt paved streets. A. B. Ratterman, prest. B. C. A. Sealed proposals will be received until Aug. 17 for the construction of sidewalks on the bridge over canal on Carthage pike in St. Bernard. E. L. Lewis, co. audt.

CONTRACTS AWARDED.

Adrian, Mich.—The contract for brick paving was awarded to John C. Carland of Toledo, O., at $1.18 a sq. yd.

Alton, Ill.—The contract for paving Front and Market-sts. with brick was awarded to Daniel Ryan at 95 cts. a sq yd.

Trenton, N. J.—The awarding of the contract for brick paving to Robt. A. Montgomery for $13,201 has been recommended.

Ravenna, O.—The contract for paving Main-st. with brick was awarded to Wildes & Davidson of Akron at 93 cts. a sq. yd.

Montreal, Que.—The contract for paving Craig-st. with asphalt was awarded to Bellhouse, Dillon & Co. at $2.41 a sq. yd.

Manchester, Conn.—Hall & Donahue of Portland secured the contract for paving Main-st. with macadam at 84 cents a lin. ft.

Lyons, N. Y.—The contract for paving Geneva-st. with Media sandstone was awarded to Contractor Horan of Medina at $4.78 a lin. ft.

South Windsor, Conn.—The contract for constructing a gravel road has been awarded to Hall & Donahue of Portland at 24 cts. a lin. ft.

Atlanta, Ga.—The Warren-Scharf Asphalt Paving company of New York City secured the contract, July 5, for paving Washington-st., from Hunter-st. to Woodward-ave., at $2.08 a square yard, or $17,082.

Nashville, Ind.—The county commissioners have awarded the gravel road contracts to Amos Musselman of Greene county for $18,588.88.

Rochester, N. Y.—Whitmore, Rauber & Vicinus secured the contract July 21 for the N. Jones-st. cement walks and curbs for $1,286.48.

Iowa City, Ia.—The contract for paving S. Summit-st., 3,090 sq. yds., has been awarded to Wm. Horrabin at $1.18, using Des Moines brick.

Pekin, Ill.—The Dunbar company of Peoria, Ill., secured the contract for macadamizing a road in this town at 93½ cts. a lin. ft.

Davenport, Ia.—The Flick & Johnson Construction company secured the contract for paving Grand-ave. and Thirteenth-st., with brick, at $1.32 a sq. yd.

Bloomington, Ill.—The contract for brick paving in W. Locust, W. Monroe, S. McLean, S. Main and E. Empire-sts. was awarded July 21 to John Cherry, jr.

Hartford, Conn.—The contract for paving Temple and Kinsley-sts. with asphalt has been awarded to the Southern New England Paving company at $2.56 a sq. yd.

Troy, N. Y.—The contract for paving Franklin-st., between Congress and Ferry-sts., with brick, was awarded July 15 to Patrick McKenna at $1.88 a sq. yd.

Camden, N. J.—Wm. H. Sherman has been awarded a contract for paving with new Belgian block on sand, at $1.19 a sq. yd., and for repaving with old block at 8 cts.

Rock Island, Ill.—The contract for paving Nineteenth and Thirtieth-sts. was awarded July 18 to the Edwards & Walsh Construction company of Davenport, Ia.

Atlanta, Ga.—The Warren-Scharf Asphalt Paving company of New York City has been awarded the contract for paving Washington-st. with asphalt on concrete at $2.08 a sq. yd.

Port Huron, Mich.—A contract for 10,800 sq. yds. of cedar block paving on concrete foundation on Erie-st. has been awarded to B. D. Bartow for $11,479.

Troy, N. Y.—The contract for paving two streets with brick has been awarded to J. J. Mooney of this city at $1.76 and $1.79 respectively. Canton brick will be used.

Mannington, W. Va.—The contract for brick paving was awarded to Henry Robrecht of Wheeling for about $80,000. McMahon, Porter & Co. repressed brick will be used.

Albany, N. Y.—Edward T. Dillon was awarded the contract July 18 for brick paving in Partridge-st., between Madison and Western-aves., at $1.98 a sq. yd.; total, $7,638.

Shelbyville, Ill.—The contract for paving E. Monroe-st. with brick has been awarded to Crews, Lough & Allison, of Arcola, at $1.26 a sq. yd. Clinton brick will be used.

Rochester, N. Y.—The Rochester Vulcanite Pavement company has been awarded a contract for asphalt paving for $29,513.72, and F. A. Brotsch for brick paving for $9,965.50.

Jersey City, N. J.—The Palisade Construction company secured the contract for extending the Weehawken loop of the Hudson county boulevard into Hoboken for $10,929.60.

Spokane, Wash.—The bid submitted by the Northwestern Asphalt company for paving Riverside-ave., with asphalt, $2.87 a square

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yard, is favored for acceptance, according to press reports.

Morristown, N. J.—The contract for constructing the Basking Ridge road has been awarded to Augusta Munson & Co. for $19,167 and for the Madison-Afton road to P. & M. Cook, for $5,164.32.

Waterbury, Conn.—Bids were received, July 13, for constructing a telford road around Candee's hill, the lowest bid being submitted by George S. Abbott, $1.25 a lineal foot. The contract has not been awarded.

Charleston, Ill.—Crews, Lough & Allison of Arcola was awarded the contract, July 15, for paving Monroe-st., with Veedersburg brick, two courses, at $1.26 a square yard and 47 cents a lineal foot for curbing, corners, etc.

Independence, Kas.—The contract for paving the public square with asphalt was awarded, July 12, to the Columbia Construction company of Syracuse, N. Y., at $1.85 a square yard. The Assyrian Asphalt company of Chicago bid $1.95.

Binghamton, N. Y.—(Special.)—H. Ward says the contract for constructing a brick pavement on Court-st., from Exchange to Liberty-sts., was awarded to Eugene Fay of Olean at $1.72 a square yard, using Mack wire cut brick.

Champaign, Ill.—G. Maffioli of Rockford presented the lowest bid for paving Green, Taylor and Walnut-sts. as follows: Brick paving, $1.19 a square yard; hard limestone curbing, 38 cents a foot; concrete curb gutters, eighteen inches wide, 39 cents a foot.

Mansfield, O.—Bids have been received for paving with vitrified brick or block, from Grandert Bros., Herring & Son and Lomax Bros. & Porter. The bids range, in aggregate, from $21,834 to $24,874. The contract has not yet been awarded.

Augusta, Me.—The contract for furnishing paving stones for Haymarket Square was awarded, July 16, to A. T. Fuller at 71 cts. a sq. yd., and the contract for laying them to John H. Turner at 27 cts. a sq. yd. and 9 cts. a lin. ft. for setting curbing.

Newport, R. I.—The contract for paving three-quarters of a mile of Thomas-st. with asphaltina has been awarded to the Boston Paving company of Worcester, Mass., at $2.50 a sq. yd., or $30,000. The Narragansett Improvement company bid $2.75 and the Warren-Scharf Asphalt Paving company $2.93.

Hartford, Conn.—The contract for work on the East Hartford causeway has been awarded as follows: Filling, Edward Balf company, 23 cts. a cu. yd.; grading and macadamizing, F. T. Ley & Co., 85 cts. a sq. ft.; laying curb and gutter, Hartford Paving and Construction company, $1.18½ a lin. ft.

Ft. Wayne, Ind.—The contract for about one mile of asphalt paving has been awarded to the Alcatraz Paving company of San Francisco as follows: Cass-st.—Berea curb, $5.12 a lin. ft.; Parkhurst curb, $5.17; Fairfield-ave., $6.17 and $6.22; High-st., $5.08½ and $5.13½.

Columbus, O.—Bids were received July 20 for paving Marshall-ave. with brick. The bids were as follows: F. D. Sullivan, Nelsonville brick or Wassall block, 93 cts. a sq. yd.; Wm. Luchtenberg, Nelsonville brick, $1; N. B. Abbott, Nelsonville brick, 95 cts. The awarding of the contract was deferred.

Washington, D. C.—The contract for paving Seventh-st., between E and G, and Fourteenth-st., S. E., was awarded to the Cranford Paving company. The bid of the Southern Asphalt Paving company of Baltimore was lower than that of the Cranford company, but the latter company offered to do the work in a shorter time.

Des Moines, Ia.—Contracts have been awarded as follows: Paving—Cottage Grove-ave. and Crocker-st., brick, Mayden, Sheely & Herrick, $1.40 a sq. yd.; Tenth-st., Capital City Brick and Tile company, $1.14. Curbing—Concrete curbing, Eighth-st., 31 3-10 cts., and Willis-st., 34 3-10 cts. a lin. ft., Allogden & Willis

Reading, Pa.—Bids were received July 18 for 51,400 sq. yds. of asphalt paving, including brick gutters and granite curbing, as follows: Pennsylvania Asphalt Paving company, $2.05, or $137,731; Richardson & Ross, $2.04, or $150,022; Alcatraz Paving company, $2.07, or $138,718. The bids were rejected on account of an insufficient appropriation.

Buffalo, N. Y.—The Barber Asphalt Paving company was awarded the contract for resurfacing Lafayette-ave., from Chapin-place to Elmwood-ave., with asphalt, for $9,000, and surfacing Morgan-st., from Niagara to Mohawk-st., for $532. Henry P. Burgard secured the contract for paving Kentucky-st., between Tecumseh and Mackinaw-sts., for $5,900.

Toledo, O.—The Warren-Scharf Asphalt Paving company was awarded the contract, July 21, for paving Madison-st. with asphalt. The contract for paving Buffalo-st. was awarded to John J. Leith for $7,088.60, using Nelsonville block and Berea curb, and Michigan-st., from Bush to Ash, will be paved with Nelsonville block with Medina curb by H. J. Bower for $11,140.35.

Muscatine, Ia.—(Special.)—J. G. Ryan, city engineer, says paving contracts were awarded, July 5, as follows: District No. 14, Buffalo brick on old macadam and sand foundation, Edwards & Walsh Construction company, Davenport, Ia., 90 cents a square yard; total, $10,495.78. District No. 15, Buffalo brick on six-inch sand foundation, Fuller Bros., city, 89½ cents a square yard; total, $8,617.94.

Rochester, N. Y.—The contract for paving Columbia-ave. with asphalt was awarded, July 12, to Chambers & Casey for $38,968. Contracts were awarded, July 21, as follows: Spencer-st., brick, F. A. Brotsch, $9,964.50; Parsells-ave., asphalt, Rochester Vulcanite Paving company, $29,513.72. July 6, Post-st., $4,984.50; Tremont-place, asphalt, Warren-Scharf Asphalt Paving company, $1,457.20.

Sioux City, Ia.—The Barber Asphalt Paving company was awarded the contract, July 14, for paving Sixth-st., from Pearl to Nebraska, with asphalt, at $2.24 a square yard. Other contracts awarded were: Third-st., from Perry Creek to Virginia-st., brick with Portland cement filler, Hansen Bros., $1.87¾ a square yard; Water-st., brick with sand filler, $1.69, and certain alleys, brick, $1.44½, J. W. Smith.

Allegheny, Pa.—The Pennsylvania Asphalt Paving company secured contracts, July 12, for asphalt paving in eleven streets and the Sicilian Asphalt company, five streets. Booth & Flinn was awarded contracts in a large number of streets for Ligonier blocks and brick paving contracts were awarded to Joseph Hastings, James McAfee & Co., Ott Bros. and John Carson & Co. The bids on

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asphalt showed an increase of 20 cents a square yard.

Easton, Pa.—T. M. Lesher & Sons of this city, presented the lowest bid, July 8, for rebuilding the Delaware road to Snyder's bridge, a distance of about six and one-half miles, as follows: Excavation, 24 cents a cubic yard; telford-limestone, 52 cents a lineal foot; trap rock, 59 cents a lineal foot; macadam limestone, 45 cents a lineal foot; trap rock, 52 cents a lineal foot; drains, ten-inch, 75 cents; twelve-inch, 68 cents, sixteen-inch, $1; eighteen-inch, $1.15 a lineal foot.

Toledo, O.—The contract for macadamizing Bancroft-st. has been awarded to G. H. Bodette at $1.20 or $4,807.78. Bids were received until July 11 for paving four streets and macadamizing one. The Warren-Scharf Asphalt Paving company presented the lowest bid for asphalt paving in Jackson-st., at $1 53, and G. H. Bodette, the lowest on brick, at $1.38. J. C. Carland was the lowest bidder on Buffalo-st., at $1.40.

Springfield, Ill.—Bids were received, July 22, for repaving First-st., from Jefferson-st. to N. Grand-ave.; paving Enos-ave., from Sixth to Twelfth; repaving Enos-ave., from Fifth to Sixth. Bretz & Son submitted the lowest bid for paving First-st. at $1.14¾ a square yard, and Welch, Patterson & Striffler the lowest for paving Enos-ave., at $1.22 and $1.24½. The awarding of the contracts was deferred for a few days.

Swanton, O.—The contract for brick paving was awarded, July 11, to Thos. McKinney of Toledo for $5,984. Itemized, his bid was as follows: Excavating, 10 cts.; catch basin, $14; inlets, $10; monument corners, $1; curbing, 26 cts.; paving, Met. brick, $1.22; Nelsonville, $1.10; Townsend, $1.14; Wassail, $1.16; Louisville, $1.15; blue granite block, $1.13; Athens, $1.10; cement filler, 7 cts.; tar filler, 13 cts.; drain tile, 3 cts.

Topeka, Kas.—The bids received July 18 for paving Madison-st., between Fifth and Sixth, were rejected, owing to Contractor Winans being five minutes tardy in submitting his bid, and as his bid, $1.18, was the lowest bid submitted, it was feared it would be grounds for a suit. The clerk was instructed to readvertise. The contract for curbing was awarded to John Ritchie, at 62⅝ cts. a lin. ft., and for grading to Furman Baker at 21¾ cts. a cu. yd.

Camden, N. J.—The contract for repaving Cooper, Market and Federal-sts. and Kaighn, Haddon and Broadway-aves. with asphalt, was awarded, July 16, to Aaron Ward at $1.52 a sq. yd. A writ of certiorari was served, however, on Contractor Ward and City Clerk Kramer, which will delay the work until the writ is dismissed or modified. The writ was obtained by the Alcatraz Paving company, which bid $1.39 a square yard, making an aggregate difference in the two bids of $22.500.

Newark, N. J.—The Barber Asphalt Paving company was awarded contracts, July 7, for asphalt paving in Prince, Richmond and Polk-sts. and Stratford-place, at $1.39

Detroit, Mich.—Bids were received and contracts awarded July 21 for brick paving in three streets. Sheahan & Co. was awarded contracts for Rivard-st. at $1.69 and Franklin-st. at $1.71 a sq. yd. The Frederick Construction company secured the contract for Second-st. Nelsonville brick will be used. Contracts for cedar blocks on concrete were awarded July 12 as follows: Talbot Paving company, Twelfth-st., Medina curb, $10,292; Crane-ave., Woolsmith curb, $22,471; Piquette-ave., Woolsmith curb, $6,163.47.

Chicago, Ill.—Asphalt paving contracts were awarded as follows: Albany-ave., from Chicago-ave. to Ohio-st., and Millard-ave., from Sixteenth-st. to Douglas Park boulevard, J. B. Smith; Western-ave., from W. Madison to W. Harrison-st., R. F. Conway & Co. Macadam—Perry-st., from Devon-ave. to Pratt-ave., Gaffney & Long; Ridge-ave., from Evanston to Clark-st., C. M. Netterstrom; N. Sawyer-ave., from Chicago-ave. to W. Kinzie-st., Sackley & Peterson. A large number of cedar block paving contracts were also awarded.

Syracuse, N. Y.—Bids were received July 19 for asphalt and brick paving. The Columbia Construction company was the lowest bidder for Trinidad asphalt paving in Park-ave., from North West-st. to Barker-ave., at $9,256.60, and Barker and Matty-aves. and Wilkinson-st., at $21,676.80. The Empire Contracting company was the lowest bidder for Alcatraz asphalt paving in Park-ave., from Barker-ave. to N. Geddes-st., at $40,-628.90. Eugene Fee of Olean, N. Y., presented the lowest bid in each instance on brick paving. The contract has not yet been awarded.

Kansas City, Mo.—The Barber Asphalt Paving company was awarded contracts for paving portions of Twelfth, Prospect and Forest-sts., with asphalt, at $2.12 a sq. yd. Other paving contracts awarded were: Eighteenth-st., from Main to Broad, brick, Fred Feigel, $1.47¼; Roberts, from Walrond to Indiana, Walker Hickman, $1.519; curbing Bales-st., from Independence to St. John, 50 cts. a lin. ft. A large number of small contracts were awarded July 14 for brick paving and walks, the most important of which was for brick paving in Troost-ave., to Walter Hickman, $1.48⅞, and Vine-st., to S. F. Schroeder, $1.47 1-3.

Ridgefield, N. J.—Bids were received July 12 for constructing a macadam road from seven firms, as follows: Robt. J. Emmer, Highwood Park, $8,175; Joseph Murphy, West Hoboken, $5,940; D. L. Barrett, Englewood, $7,800; J. A. Winterburn, Edgewater, $4,975; Palisade Construction company, Jersey City, $7,976; Cannon & Marronne, $8,400; John Collins, Jersey City, curbing, 40 cts. a lin. ft.; telford, 50 cts. a sq. yd.; crushed stone, $2 a cu. yd.; Brook paving, 12 cts. a sq. ft.; excavating, 30 cts. a cu. yd.; rock cutting, $2; stone work, 20 cts. a lin. ft.; Belgian blocks, $1.50 a sq. yd.; mountain dressed stone, 85 cts. a sq. yd.; basins complete, $1.50.

Indianapolis, Ind.—The contract for making

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the contract for asphalt paving and cement sidewalks in Delaware-st., from Twenty-third to Twenty-fourth, at $4.91 a lin. ft. each side. The Warren-Scharf Asphalt Paving company secured the contract for asphalt paving and cement walks on Delaware-st., from Twenty-fourth to Twenty-fifth, at $5.94 a lin. ft.

Salem, O.—Bids were received July 12 for asphalt block paving in Lincoln-ave. and brick paving in E. Main-st., exclusive of curbing, gutters, foundation, etc., as follows: Lincoln-ave., 13,800 sq. yds., John Hadley, Canton, O., New Castle asphalt block, $1.45 a sq. yd., total $28,532; W. A. Adams, Pittsburg, N. C. asp. blk., $1.49, or $30,480; Smith & Buell, Salem, N. C. asp. blk., $1.37, or $26,278; J. A. Kelly, Portsmouth, N. C. asp. blk., $1.34, Balto. asp. blk., $1.43, or $27,654; Davis & Caldwell, Youngstown, N. C. asp. blk., $1.38, Balto. asp. blk., $1.50, or $26,197; J. Will Mitchell, New Castle, Pa., N. C. asp. blk., $1.35, or $28,111; T. J. Mulligan, Ironton, N. C. asp. blk., $1.40, Balto. $1.57, or $26,854. The bids submitted for paving E. Main-st. with brick ranged from $8 to $12.50 per 1,000 on the different manufactured brick, the total bids aggregating as follows: C. C. Morse, Cleveland, $35,355; W. B. Dager, Canton, $37,226; John Hadley, Canton, $32,049; Sam Buell and George D. Smith, Salem, $32,026; W. A. Adams, Pittsburg, $43,464; J. A. Kelly, Portsmouth, O., $35,454; Davis & Caldwell, Youngstown, $35,746; Park Paving company, Pittsburg, $36,159; T. J. Mulligan, Ironton, $37,186.

Newburgh, N. Y.—Bids or paving Liberty-st., between Broadway and Renwick, have been received as follows: Hastings Paving company—Asphalt block on six-inch concrete base, $2.65 a square yard; four-inch base, $2.50; granite block for sag. on three-inch concrete, $2.95; new curb, 33 cents a foot; resetting old curb, 10 cents; bridge stone, 40 cents a foot; lowering railroad tracks, 20 cents a foot; raising low spots with gravel, 50 cents a cubic yard; ten-year guarantee. W. R. Johnson, Catskill—Brick, cement joint, $1.98; pitch joints, $2.06; granite block for sag., $2.50; new curb, 45 cents; old curb, 23 cents; bridge stone, 50 cents; lowering tracks, 25 cents; raising low spots with gravel, 75 cents. D. C. Miller, Newburgh—Asphalt block, $2.99; best brick, laid in cement, $2.26; on crushed stone, $1.94; granite block on sand with cobble between and on either side of railroad tracks, $1.83; bridge stone, 54 cents; new curb, 34 cents; old curb, reset, 10 cents; raising low spots with gravel, 60 cents; lowering railroad tracks, 15 cents. M. J. Dwyer, Newburgh—Granite block, $1.79; asphalt block, $2.73; vitrified brick, $1.94; bridge stone, 50 cents; new curb, 30 cents; old curb, 5 cents; lowering tracks, 15 cents; raising low spots, 80 cents. Barber Asphalt Paving company—Asphalt, $1.67; new curb, 32 cents; old curb, 5 cents; lowering tracks, 20 cents. In advertising for the bids no particular kind of pavement was mentioned, and, owing to this reason the bids were so complicated that the contract could not be awarded until the city engineer has given them close examination.

SEWERS.

Gainesville, Tex.—(Special.)—The Odorless Sewerage company is laying a sewerage system in this city.

New Britain, Conn.—Thomas S. Bishop, L. Hoyt Pease and Peter Long have been appointed an advisory board to act in conjunction with the sewer commissioners in devising a solution of the sewerage problem.

Brooklyn, N. Y.—The sewage purification plant, which was completed about a year ago in the Twenty-sixth ward, will be put in full operation soon. The plant has remained practically idle for lack of funds, but the sum of $12,000 has been appropriated by the board of estimate for the operation of the plant.

CONTEMPLATED WORK.

Oil City, Pa.—Sewers will be constructed in several streets.

Hudson, Wis.—The council has voted to adopt a plan of sewerage.

Omaha, Neb.—The construction of a district sewer is contemplated.

Aiken, S. C.—The construction of a sewerage system is contemplated.

Mt. Pleasant, Pa.—Plans are being prepared for a sewer by Cy. Engr. Neel.

Little Falls, N. Y.—Sewers will be built in a number of streets. Mayor Dasey.

Massillon, O.—The construction of the West Side sewerage system is contemplated.

Topeka, Kas.—The construction of a sewer in the First ward has been authorized.

Akron, O.—Ordinances have been passed for constructing several storm water sewers.

Monmouth, Ill.—Plans are being prepared for a district sewer by J. Ed. Miller, engr.

Worcester, Mass.—The city council has authorized the $300,000 sewage disposal loan.

Champaign, Ill.—An ordinance was passed July 19 to lay lateral sewers. Mayor Scott.

Grass Valley, Cal.—The question of constructing a sewerage system is being agitated.

Miller's Falls, Mass.—The sum of $1,000 has been appropriated for a sewer in Grand-ave.

Dalton, Ga.—Plans are being prepared for a sewerage system by J. L. Ludlow of Winston, N. C.

Hamilton, O.—A storm sewer will be built in district No. 7 at a cost of $3,500. M. O. Burns, cy. clk.

Troy, N. Y.—A pipe sewer will be built in Bond-st., instead of a brick sewer. Cy. Engr. Schenck.

Kansas City, Mo.—The construction of another section of the Vine-st. sewer this year is proposed.

Kingston, N. Y.—The proposed five-foot brick trunk sewer will not be built this year. W. Klingberg, cy. engr.

Oakland, Cal.—This city has voted to construct sewers in several streets. J. W. Tompkins, cy. clk.

Springfield, Ill.—An expenditure of $26,444 for sewers and paving is contemplated. F. H. Hamilton, cy. engr.

Lancaster, N. Y.—Plans are being prepared for a sewerage system for this place. Geo. Bingham, chrmn. com.

Marshfield, Wis.—The council contemplates building a tile sewer on Fourth-st., from Chestnut to Central-ave.

West Hartford, Conn.—Plans are being prepared for a sewer for the center of the town, by Surveyor R. Alterson.

Philadelphia, Pa.—Ordinances were passed, July 13, authorizing the construction of main sewers in several streets.

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Hartford, Conn.—The construction of a four-foot sewer in Lawrence-st., between Grand and Park-sts., is contemplated.

Fairfield, Ia.—Plans for a sewerage system for this city are being prepared by C. R. Allen, C. E., of Ottumwa, Ia.

Seattle, Wash.—The construction of a sewer is proposed on Blanchard-st., Fifteenth-ave. and Dearborn-st

Paterson, N. J.—The construction of 1,200 ft. of 15 and 12-in. pipe sewers is proposed. Thos. McLean, st. comr.

Cumberland, Md.—Press reports state that a sewerage system will be the next improvement at Mountain Lake Park.

Columbus, Ga.—The question of issuing $150,000 bonds for sewer and bridge construction will be voted on Aug. 19.

Rhinelander, Wis.—The board of public works has authorized the construction of sewers on Stevens-ave. and Oneida-st.

Elgin, Ill.—The construction of 2,000 ft. of 38 to 56-in. brick sewers is contemplated. Adin Mann, cy. engr.

Portland, Mich.—The construction of sewers in several streets is contemplated at a cost of $3,700. D. C. Crawford, engr.

Salina, Kas.—Plans and profile have been prepared for a sewerage system. Councilman Kaffer interested.

La Crosse, Wis.—The council will recommend, at its meeting Aug. 12, that a sewer be constructed on Fourth-st., from Cass to Market.

Madison, Wis.—An ordinance has been passed to construct a storm sewer in the N. Hamilton-st. district. O. S. Norsman, cy. clk.

Riverside, Cal.—The city engineer has been directed to prepare maps and resolutions for the proposed Twelfth-st. sewer.

Waycross, Ga.—This city voted against issuing bonds for a sewerage system, July 9, and another election will be called in January.

Marysville, O.—Dr. C. O. Probst, secy. State Bd. of Health, has been directed to prepare plans for a sewerage system for this city.

Cincinnati, O.—Plans and specifications are being prepared for a main sewer in Camp Washington, from the Miami Canal to Mill Creek.

Kansas City, Kas.—The board of public works has directed City Engineer Wise to prepare plans for a sewerage system for Westport.

Galveston, Tex.—Reports state the committee is about to recommend the purchase of a private sewerage system. Dr. H. A. West, chrmn. com.

Preston, Minn.—The village council decided, July 19, to construct a sewerage system around the public square and through the main street to the river.

Specifications are being prepared for a sewerage system for this city by Riggs & Sherman of Toledo, O.

Columbia, S. C.—A plan has been submitted by City Engineer Wilson for a general sewerage system and a water works system. Estimated cost, $45,000.

Poplar Bluffs, Mo.—Surveys and plans are being made for a sewerage system for this city, and bids will be asked soon. W. H. Hipolite, cy. engr.

Olivia, Minn.—The county has voted to construct a drainage ditch through the towns of Melville, Hector and Preston Lake. Estimated cost, $20,000.

Independence, Mo.—Plans are being prepared for a sewerage system for this city by Andrew Rosewater, C. E., Omaha, Neb. H. H. Pendleton, cy. engr.

Emeryville, Cal.—The plans for a sewerage system, prepared by the city engineer, provides for 19,260 ft. of 14 to 6-in. pipe sewers. J. S. Emery, chrmn. com.

Bay City, Mich.—The city engineer has been instructed to prepare plans for a 20-in. brick sewer on State Road-st., from Center-st. to the Twenty-third-st. bridge.

Anaconda, Mont.—Notice of intention has been published of the proposed construction of sewers in special sewer improvement districts Nos. 7, 8, 9, 10, 11 and 12. T. O'Leary, cy. clerk.

Taylorville, Ill.—Preliminary surveys and plans for sewers have been prepared and contracts will be let soon. Fred Kinney, James Bourne and T. E. Hobson, sewer com. C. W. Campbell, town clk.

Victor, Col.—Andrew Rosewater, C. E., of Omaha, Neb., is making an examination of the topography of this city, in order to advise the council of the feasibility of inaugurating a sewerage system.

Washington, D. C.—The district commissioners have ordered the construction of a 24, 21 and 18-in. pipe sewer in Sixteenth-st., from Florida-ave. to Morris-st., at an estimated cost of $2,875.

Napoleon, O.—(Special.)—Riggs & Sherman, Toledo, O., have been selected to prepare plans and specifications for a complete system of sanitary sewers for this town.

Denevr, Col.—The board of public works contemplates the construction of a system of storm sewers to drain the eastern portion of this city as far as the city park. The estimated cost is $750,000.

Northampton, Mass.—The plans for new sewers on Prospect, King and Maple-sts. have been examined by the sewer commissioners, and it is probable that the sewer will be built. The plans were prepared by Engineer Thacher.

Sherman, Tex.—A proposition of the Pennsylvania Sanitation company of Philadel-

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has visited Providence, Worcester and other cities for the purpose of studying methods for the proposed sewage disposal system in the Highlands. O. D. Allyn and Gilbert Potwin, Jr., com.

CONTRACTS TO BE LET.

Decatur, Ind.—Bids are asked until Aug. 2 for constructing a sewer. H. B. Knoff, C. E.

Cedarfalls, Ia.—Bids are asked until Aug. 2 for building a sewer. D. M. Rosser, cy. engr.

Terre Haute, Ind.—Bids will be received until Aug. 2 for constructing a pipe sewer. Chas. H. Goodwin, cy. clk.

Wallingford, Conn.—Bids are wanted Aug. 2 for 6,600 ft. of 30-inch pipe sewer. John E. Downs, mem, sewer com.

Plattsburg, N. Y.—Bids are asked until Aug. 2 for the extension of the sewerage system. S. L. Wheeler, chrmn. com.

Cedar Rapids, Ia.—Bids are asked until Aug. 20 for an 18-inch storm water sewer. R. N. Buck, chrmn, com. pub. imp.

Waverly, Ia.—Sealed proposals will be received until Aug. 2 for constructing an 8-inch pipe sewer. D. A. Long, cy. clk.

Marietta, O.—Sealed proposals will be received until Aug. 5 for constructing a brick and stone culvert at Fourth and Marion-sts. Carl Becker, cy. clerk.

Cincinnati, O.—Sealed proposals will be received until Aug. 3 for constructing sewers and drains in Stock-ave. A. B. Ratterman. clk. bd. cy. affairs.

Savannah, Ga.—Sealed proposals will be received until Sept. 1 for constructing a complete system of house drainage. Address com. on drainage, care clk. of coun.

Columbus, O.—Sealed proposals will be received until Aug. 3 for connecting the sewer in Sullivan-ave. with the Renick run sewer. Jas. A. Fanning, clk. B. P. W.

Boston, Mass.—Sealed proposals will be received until Sept. 3 for additions to the pumping plants at the Metropolitan sewerage pumping station at Deer Island, East Boston and Charlestown. Wm. R. Brown, jr., ch. engr. Met. Sewerage Com'rs.

Toledo, O.—Sealed proposals will be received until Aug. 8 for constructing a cylindrical brick sewer in Eastern, Greenwood and Parker-aves. and Mettler-st. and certain alleys. Lem P. Harris, cy. clk.

Huntington, Ind.—Sealed proposals will be received until Aug. 9 for constructing a 24x36-in. brick sewer on Front-st., from Jefferson to Whitelock-st.; 24-in. pipe sewers on Whitelock-st.; 12-in. pipe sewer on High-st.; branch sewer connections, catch basins, inlets, house drains, manholes, etc. Frank Guthrie, Cy. C. E.

Cleveland, O.—Sealed proposals will be received until Aug. 11 for constructing a sewer in Miles Park-st., between Broadway and Sawyer, with necessary storm overflow and storm overflow outlets. Bids will be received until Aug. 19 for constructing an earth embankment, including slopes, grading, catchbasins, connections and drainage therefor, on Warner road. Geo. R. Warden, Dir. Pub. Wks.

CONTRACTS AWARDED.

Hartford, Conn.—P. H. Harrison & Sons secured the contract for building a sewer on Woodland-st.

Fall River, Mass.—The contract for constructing an outlet sewer on Odd-st., has been awarded to Beatty & Wilcox of this city for $10,300.

Avalon, Pa.—The contract for building sewers was awarded to J. A. Ranson of Sharpsburg for $25,000.

Boston, Mass.—T. J. Young & Co. has been awarded the contract for 4,991 ft. of sewers for $6,093.

Racine, Wis.—The contract for constructing a sewer in Park-ave. was awarded to Jas. Cape & Sons.

Toledo, O.—The contract for constructing the main sewer has been awarded to Alex. Dawson & Co. for $19,728.

Esplen, Pa.—The contract for constructing sewers has been awarded to Cronnin & O'Herron, Pittsburg, Pa., for $3,627.

Brewer, Me.—The contract for constructing sewers in twelve streets has been awarded to Isaac Lunt of Bangor for $7,375.

Big Rapids, Mich.—The contract for constructing the State-st. sewer was awarded to Martiny & Lipps for $1,455.63.

Fergus Falls, Minn.—The contract for constructing the Whitford-Cleveland sewer was awarded to M. Frankoviz for $2,993.

Parkersburg, W. Va.—S. E. Irwin, Hamilton, O., was awarded the two sewer contracts, July 11, at $4,287.26 and $6,885.64, respectively.

Albany, N. Y.—Michael F. Dollard was awarded the contract, July 18, for constructing pipe sewers in Dove and Spruce-sts. for $1,633.

Rochester, N. Y.—William H. Jones & Sons were the lowest bidders July 10 for a sewer in Berlin-st. at $1,869.80, and in Wilkin-ave. at $2,430.02.

Huntington, Ind.—Fisher, Keefer & Bailey of this city were awarded contracts for sewers at $2.31 per lin. for 600 ft. and $2.35 for 2,600 ft.

Port Huron, Mich.—The contract for constructing 1,610 ft. of 24 to 8-in. pipe sewer in Fourteenth-st. has been awarded to W. F. Ernst for $2,275.

Le Sueur, Minn.—Tschirgi, Steuch & Co. of Dubuque, Ia., were awarded the contract for constructing a sewer for $2,125, and house connections for $257.

Lancaster, O.—Ingham & Neeb of this city secured the contract for constructing sewerage at the Boys' Industrial School at $5,861, and sewage disposal for $9,029.

Janesville, Wis.—The contract for constructing a portion of the sewerage system for this city has been awarded to Harding & Nelson of Racine for $1,545.

Owosso, Mich.—The contract for constructing sewers in Main, Shiawassee and Michigan-aves. was awarded July 13 to J. J. Granville of Saginaw at prices ranging from 7 cents to $3 a foot.

Muscatine, Ia.—(Special.)—J. G. Ryan, cy. engr., says the contract for constructing a main sewer in sewerage dist. No. 2 was awarded July 5 to Wm. Horrabin of Iowa City, Ia., for $3,695.55.

Camden, N. J.—Contracts for brick and pipe sewers have been awarded to Aaron Ward and Wm. Thompson of this city at prices ranging from 80 cts. to 82 cts. for brick sewers and from 43 to 60 cts. for pipe sewers.

Erie, Pa.—Edward Driscoll was awarded the contract for constructing a 15-in. pipe sewer in Eleventh-st., as follows: Straight and curve pipe, $1.45 a ft.; 9-in. pipe, 40 cts. a ft.; 6-in. pipe, 40 cts. a ft.; Y and T branch pipe, $1.90; manholes, $40.

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WATER-WORKS.

Newark, O.—The Newark water works have been ordered sold by the court for not less than $234,000.

Reading, Pa.—Slow sand filtration is recommended in a special report just published by the water commissioners.

Great Falls, Mont.—The city council has agreed to purchase the present water works plant for $375,000.

Watervliet, N. Y.—William F. Ross of New York City has been appointed receiver of the Watervliet Water Works company by Justice Chester.

Franklin, Ind.—The advisability of purchasing the plant of the Water, Light and Power company is being considered by the city officials.

Beloit, Wis.—The common council voted, July 18, to purchase the city water works, now owned by Chas. and Edward Salmon. The price asked is $210,000.

Des Moines, Ia.—The question of municipal ownership will be voted on Aug. 19. The proposition is to buy the plant of the Des Moines Water Works company for $850,000.

Brooklyn, N. Y.—The board of estimate decided, July 11, to issue $570,000 bonds for the purchase of the Long Island water works, which have been furnishing water to this city.

Appleton, Wis.—Herman Erb has been appointed receiver for the Appleton Water Works company upon the application of the Central Trust company of New York City, which holds a mortgage of $200,000 against the water works plant.

Barre, Vt.—Geo. A. Kimball, M. Am. Soc. C. E., member of the Metropolitan Sewerage Commission, Boston, Mass., has been appointed by the city council of this city a member of the commission to fix the price of the water works, which they contemplate purchasing.

Jersey City, N. J.—The bids for the proposed new gravity water supply are to be made on the basis of first constructing works of sufficient capacity to deliver 50,000,000 gals. of water daily at the Bergen reservoirs, at an elevation of 210 ft. above mean high tide, through a single pipe line, but the drainage area must have a capacity of 70,000,000 gals. a day.

The city of Moscow, Russia, has made an appropriation of $32,500 for the purpose of experimenting with mechanical filtration. The work will be undertaken by Nicholas P. Simon, chief engineer and superintendent of the Moscow water works, and the general arrangement of the experiments will be similar to those of Chas. Hermany, at Louisville, and Allen Hazen, at Pittsburg. The tests will last about a year.

Los Angeles, Cal.—The water supply committee recommended July 18 that all propositions, except that of municipal ownership of the water plant, be filed or laid on the table.

CONTRACTS TO BE LET.

Cattaraugus, N. Y.—Bids are asked until Aug. 4 for additions and extensions to the water works system. Frank S. Oakes, prest. bd. water comrs.

Martinsburgh, W. Va.—Bids are asked for furnishing and erecting a compound condensing duplex pump of 2,500,000 gals. capacity. Water Bd.

Albany, N. Y.—Sealed proposals will be received until Aug. 2 for water filtration plant, contract No. 7, consisting of pumping station and intake. Geo. I. Bailey, supt.

Pomeroy, O.—Sealed proposals will be received until Aug. 10 for constructing a system of water works in this city for the Pomeroy and Middleport Water company. Geo. McDonald, prest.

Winnipeg, Man.—Sealed proposals will be received until Aug. 8 for cast iron pipe, specials, hydrants, valves, etc., for the establishment of a water works system.

Lancaster, Pa.—Bids will be received until Aug. 20 for furnishing and erecting two compound horizontal duplex pumping engines of 500,000 gals. each. C. D. Hilles, secy. bd. trustees Boys' Industrial School.

Minneapolis, Minn.—Sealed proposals will be received until Aug. 26 for erecting one or two 10,000,000-gal. vertical, triple-expansion, high duty pumping engines for the North Side pumping station. L. A. Lydiard, cy. clk.

Chicago, Ill.—Sealed proposals will be received until Aug. 30 for the construction and erection of electricity operated traveling cranes for the new pumping station at Springfield-ave. and Central Park-ave. L. E. McGann, comr. pub. wks.

Norwood, N. Y.—Bids will be asked about Sept. 1 for furnishing and constructing five miles of cast iron water pipe, hydrants, standpipe, etc., for the proposed water works. A filtration plant will also be put in. Watson B. Berry, prest. Norwood Water company, Massena, N. Y.

Rock Island, Ill.—(Special.)—Bids will be received until Aug. 1 for the remaining contracts of the water works, which will include cast iron pipe and specials, valves, lining for the reservoirs, gravel, sand, etc., for the filters. Jacob A. Harmon, Peoria, Ill., cons. engr.

CONTEMPLATED WORK.

McLeansboro, Ill.—An appropriation of $32,000 for water works is reported.

McKinney, Tex.—Bids will be asked soon for a water works system. J. M. Pearson, mayor.

Olin, Ia.—Surveys for water works have been made by Charles P. Chase of Clinton, Ia.

Oxford Junction, Ia.—Plans have been prepared for a water works system. J. K. Bloom, cy. rec.

Brockton, Mass.—An appropriation of $10,000 has been authorized for water main extensions.

Pawtuxat, R. I.—The question of filtration for the water supply is being considered.

Sioux Falls, S. D.—Plans have been sub-

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Owatonna, Minn.—Plans are being considered by which the city water supply may be increased. Mayor Virtue.

Bridgeton, N. J.—The Water Committee is said to have been directed to procure plans for a standpipe.

Alden, N. Y.—The question of again voting on the proposition to issue bonds for water works is being considered.

Gaylord, Kas.—A plan for providing Main-st. with water mains and hydrants for fire protection is being discussed.

Connersville, Ind.—The question of having a new water supply and a new pumping station is being considered. Mayor Frost.

Mt. Sterling, Ky.—Press reports state that Mayor Baird has been instructed to receive estimates for a water works system.

Colton, Cal.—The citizens have voted favorably on the proposition to issue $20,000 bonds for the extension of the municipal water system.

Orange, N. J.—An adequate plan for increasing and improving the water supply of this city has been submitted to the common council by Mayor Truman.

College Hill, O.—Plans and specifications are being prepared for the water works system and bids will probably be asked about Aug. 15. M. T. Layman, asst. engr.

Taunton, Mass.—The question of making improvements to the water works and adding a new 8,000,000 gal. engine is under consideration. Geo. I. Chace, supt.

Berkeley, Cal.—J. L. LeConte, Dr. Thomas Addison and Ed F. Mehaus have been appointed a committee to investigate the advisability of running a municipal water plant.

Santa Barbara, Cal.—The clerk has been authorized to advertise for bids for a pumping plant to supply salt water for road sprinkling in the First district.

Cumberland, Md.—Mayor Keen has recommended an appropriation of $2,000 for use by the committee for investigating the advisability of securing a better water supply.

Idaho Falls, Idaho.—The question of purchasing the water works and electric light plant of the Eagle Rock Water Works company, will be voted on Aug. 9. Geo. Chapin, chrmn. com.

Albany N. Y.—The water commissioners have asked for $36,000, according to press reports, for cleaning the Bluker reservoir and for constructing a wall dividing said reservoir.

The question of issuing bonds for water works construction will be voted on as follows: Durham, N. C., Aug. 1; Ward, Col.; Galesville, Wis.; Hampton, N. H.; Lakeville, Minn.

CONTRACTS AWARDED.

Flagstaff, Ariz.—Geo. W. Sturtevant of Chicago was awarded the contract for constructing water works for $85,000.

Whiting, Ind.—The contract for furnishing and laying cast iron pipe has been awarded to J. M. Healy of Chicago for $2,148.

Ogden, Ia.—The contract for constructing a system of water works was awarded to Fairbanks, Morse & Co. of Chicago for $4,367.

Cambridge Springs, Pa.—The contract for the water works system has been awarded to Chandley Bros. & Co. of Beaver Falls, Pa., for $19,000.

Morris, Minn.—(Special.)—The contract for constructing water works was awarded July 9 to the Dubuque Construction company of Dubuque, Ia., for $25,820.

Batesville, Ark.—The contract for constructing water works and an electric light plant has been awarded to G. Jaeger of Spring Hill, Mo., for $24,700.

Fosston, Minn.—The contract for building a water works system and electric light plant has been awarded to Fairbanks, Morse & Co. of Chicago for $5,500.

Parkersburg, W. Va.—Thos. H. Regan & Co. of Philadelphia was awarded the contract July 11 for about 1,000 ft. of 36-in. cast iron conduit and extension of 14-in. pumping main for $12,600.50.

Cincinnati, O.—The lowest bid submitted July 22 for masonry, grading and excavation on the property where the new water works plant will be located at California, O., was that of Louis Drach, $91,901.40.

Latrobe, Pa.—Henry R. Worthington, New York City, secured the contract July 18 for furnishing pumping engines for the Latrobe Water company; boilers, the Erie City Boiler company, Erie, Pa.; pipe laying, H. F. Stark, Greensburg. The contracts for building the pumping station and reservoir will be let later.

St. Louis, Mo.—Bids were received July 15 for supplying and laying several miles of water pipe to extend the water distribution system. The lowest bidders were: American Pipe and Foundry company, $14.08 per ton; total, $47,168; laying pipe, two contracts, Geo. P. Prendergast, $11,400 and $8,520; valves, Michigan Brass and Iron Works, $7,965; special castings, Magnetite Foundry company, $6,200; fire plugs, Pleuger & Enger, $7,450.

BRIDGES.

Algonquin, Ill.—The village board will advertise for bids for an iron bridge.

Champaign, Ill.—Bids will be asked soon for a bridge. G. W. Hubbard, mayor.

Alma, Neb.—Bids will be received until Aug. 9 for building nine iron bridges.

London, O.—Bids are wanted until Aug. 10 for building a bridge. W. D. Wilson, co. audt.

Elroy, Wis.—The construction of an iron bridge at Academy-st. is contemplated by the council.

Youngstown, O.—A petition is being circulated for a bridge connecting Steelton with this city.

Cary, Ill.—The erection of an iron bridge over Fox river, to replace the present structure, is contemplated.

Urbana, Ill.—The contract will be let Aug. 4 for two highway bridges on masonry. Ira O. Baker, Champaign, Ill.

Hartford, Conn.—The construction of a new bridge over the railroad tracks at Broad-st. is proposed.

Hillsboro, Or.—The county commissioners contemplate replacing the bridge over Daisy creek with a 46 foot span truss bridge.

Canton, O.—The erection of a 100-foot span truss bridge on S. Cherry-st. is contemplated. Wm. M. Reel, co. audt.

Waterloo, Ia.—Bids will be advertised for by County Surveyor Newton for a new 106-foot bridge to cross the Blackhawk.

Owosso, Mich.—The construction of a truss bridge has been recommended across the Shiawassee river at Main-st.

Sidney, O.—Bids will be received until Aug.

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3 for constructing the superstructure of a hoist bridge at Water-st. J. S. Laughlin, co. audt.

Des Moines, Ia.—A petition has been presented to the council for the construction of a bridge over the Des Moines river at E. Sixth-st.

Memphis, Tenn.—The city engineer has been instructed to prepare plans for a bridge to be built across the tracks at Jefferson-st.

Herkimer, N. Y.—An appropriation of $13,500, for constructing a bridge across West Canada Creek, has been voted by this town.

Batavia, O.—Bids will be received until Aug. 10 for constructing a steel bridge across the east fork of the Little Miami river. John W. Davis, co. audt.

White Plains, N. Y.—The county supervisors have voted to issue bonds for constructing bridges across Rowley Brook and Hastings Ravine, on the Warburton-ave. extension.

Lebanon, O.—Sealed proposals will be received until Aug. 22 for the masonry and iron substructure to a bridge over Caesar's creek. P. O. Montfort, engr.

Bangor, Mich.—The Wrought Iron Bridge company of Canton, O., secured the contract for building a new iron bridge across the mill pond on the town line road, for $1,872.

Grand Detour, Ill.—The Ogle county board has voted an appropriation of $20,000 toward building an iron bridge across the Rock river on the county line.

New Haven, Conn.—The board of aldermen has authorized the issue of $290,000 for the construction of bridges at Chapel-st., over Mill river, at Derby-ave. and at Willow-st.

Indianapolis, Ind.—The contract for constructing a wooden bridge over the canal at Roache-st. has been awarded to the Wrought Iron Bridge company of Canton, O., for $914.

Towson, Md.—The Wrought Iron Bridge company, Canton, O., was awarded the contract July 13 for building a bridge over the Gunpowder Falls, about five miles from Parkton, for $2,397.

Schodack, N. Y.—It is proposed to construct a bridge across the railroad tracks at Brookview, at a cost of $12,000. E. E. Stone, Springfield, Mass., engineer in charge.

Cleveland, O.—Sealed proposals will be received until Aug. 17 for the construction of the substructure of the Five-Mile lock bridge across the Ohio canal on the line of the Haward road in Newbury township. J. C. Dorn, clk. co. comrs.

Jackson, Miss.—(Special.)—Bids will be received until Aug. 2 for constructing a steel bridge 100 ft. wide and 86 ft. span, with buckled-plate floors; for removing the present iron bridge; for masonry abutments; also alternate bids for an arch bridge, either brick, concrete or Melan system. Walter G. Kirkpatrick, cy. engr.

the Perkiomen creek in Franconia and Salford townships; for masonry and superstructure of a bridge over the Perkiomen creek in Upper Hanover township, or for the masonry of a 3-arch stone bridge at the same place; masonry for three bridges. A. W. Corson, engr.

PARKS.

Spokane, Wash.—The council is considering an ordinance to appropriate $10,000 for improving the parks.

Indianapolis, Ind.—The council has passed an ordinance authorizing the expenditure of $235,215 for the purchase of land and laying out of parks.

Trenton, N. J.—The court of errors affirmed the decision, July 8, of the supreme court in the matter of involving the validity of the proposed issue of $1,500,000 for the extension of the Essex county park system, holding that it was properly submitted to the voters of Essex county in April, 1898, upon separate ballots.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Newport, Ky.—Estimates are desired for a garbage disposal plant. W. L. Glazier, cy. engr.

Baltimore, Md.—The cleaning of the sewers of this city is proposed at a cost of about $100,000. St. Cleaning Com'r. Bye.

East Orange, N. J.—The lowest bid submitted for scavenger work in this township, July 11, was that of Charles F. Finan, $2,900 a year.

Wheeling, W. Va.—The board of health is reported as having directed A. L. White, cy. engr., to visit eastern cities to study methods of garbage disposal plants.

Los Angeles, Cal.—The present contract for street sweeping expires Nov. 20 and bids will soon be asked by the council for new contracts. It is proposed to have some of the down-town streets swept by hand next year.

St. Louis, Mo.—Bids were received July 14 for the disposal of garbage for ten years, as follows: Rich & Sale, Rowe building, St. Louis, $1,960,000, at the rate of $196,000 per year; J. W. Thompson & Co., Wainwright building, St. Louis, $1,335,000, ranging from $100,000 for the first year to $147,000 for the tenth year; Edward Butler, 13 S. Tenth-st., St. Louis, $2,941,982, ranging from $245,031 to $359,895; Hill & O'Meara Construction company, St. Louis, $2,697,000, ranging from $261,000 to $277,000; S. S. Wade & Henry Mueller,

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Municipal Engineering

VOLUME XV. SEPTEMBER, EIGHTEEN NINETY-EIGHT. NUMBER 3.

DEFECTS OF CREOSOTED WOOD BLOCK PAVEMENTS.

By F. A. Hetherington, M. E.

There has perhaps never before been such a searching for information and data relating to the making of good roadways and streets as at the present time, and the municipal engineer is apt to be so beset with apparently sound arguments for and against each particular method of street paving that may be proposed, that he is wise indeed who can sift the wood block pavement as known to the citizens of Indianapolis. These observations may be verified by any who care to go to the trouble of inspection; all may not agree with the conclusions drawn therefrom by the writer, nor does he offer them as final truths in the matters to which they pertain, but simply as a contribution to the literature of street making.

CREOSOTED WOOD BLOCK PAVEMENT ON WEST MICHIGAN STREET, INDIANAPOLIS, SHOWING SWELLING OF BLOCKS.

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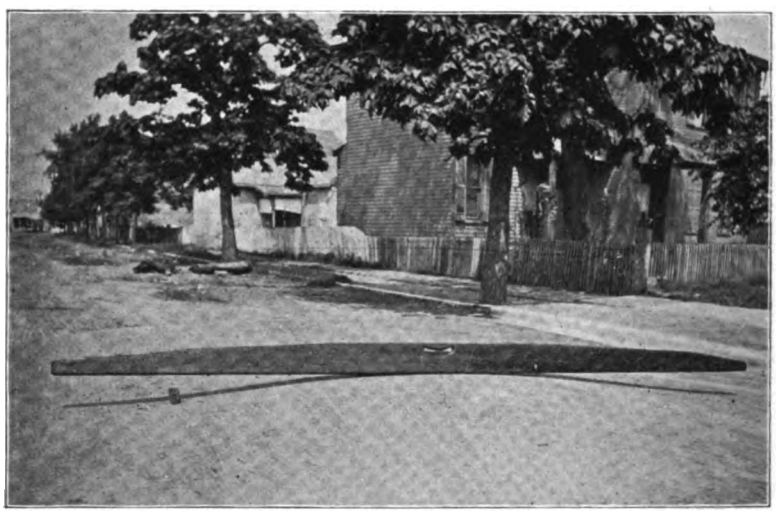
her finest thoroughfares the remains of what was once considered a very fine thing in the way of a wood pavement, now so rough broken that it is carefully avoided by all who are not compelled by necessity to drive thereupon. Since this particular pavement, made of the round block ends of small saw logs, was laid, in 1886, or near that time, there have been put down various other wooden pavements, each perhaps an improvement upon its predecessors, yet none that has yet undergone the test of two years' service has proven satisfactory in all respects. The latest Richard in the field is the kind known as the creosoted block; similar in many respects to any other pavement made of like pine blocks set in like manner; differing mainly in that the blocks wood in this case—but wood pavements.

It is a generally accepted fact among engineers that creosote, properly applied, is conducive to the greater enduring qualities of any wood or timber; that it delays rot and the destructive assault of insects. This we shall admit without discussion, in order that we may at once come to the question, What causes the deterioration of wooden pavements? Is it really that the blocks rot and decay, or is there another force at work—a force against which creosote can not avail? Our observations seem to indicate that the latter condition prevails. In order that the reader may better understand the cases here cited the accompanying illustrations are provided.



CREOSOTED WOOD BLOCK PAVEMENT ON WEST MICHIGAN STREET, INDIANAPOLIS, SHOWING SWELLING OF BLOCKS.

Figure 1 is intended to represent

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ment. During the three years which have elapsed since this surface was laid the writer has ridden over it from end to end almost daily, and has seen it gradually deteriorate until at the present time its appearance is fairly well represented in this illustration.

The blocks of which this pavement was made were of selected Washington cedar, not treated with any foreign substance. In those portions of the pavement which lie in between intersecting streets the blocks are laid diagonally. That the deterioration of the blocks of this pavement was not caused by damp or rot is distinctly proven by the fact that for a distance of three feet from the curb out, on each side, they are in almost perfect condition at the present time. The blocks at the center are worn to some extent, but extending up and down the street as far as the eye can reach, midway between the center and the curb, are two broad bands of rough chipped blocks.

Reasoning from effect to cause we at once perceive that these two broad bands of rough blocks are the portions of the street that receive the wear and tear of the pounding of thousands of iron-shod hoofs of the horses that are speeded in this formerly favorite roadway.

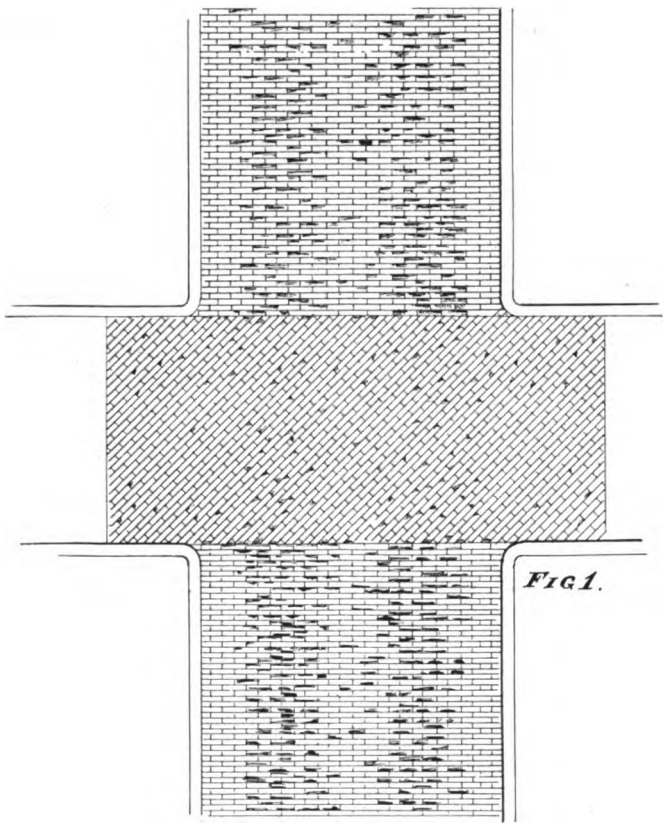

FIG 1.

At the intersection, where there is naturally more travel than between, it is found, strange to say, that the blocks of the pavement are in not nearly so bad condition as in other portions of the street. Why is this? In Figure 2 is illustrated

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what we are led to believe is the real cause of the instability of wooden block pavements. It is not decay that breaks down the surfaces; it is the hammer-like blow from the sharp-edged calk of the iron shoe. First, the extreme edge is split off as shown, the split off portion breaking off at a point about three-eights inches below the surface; then comes another blow, and another, each chipping off a small

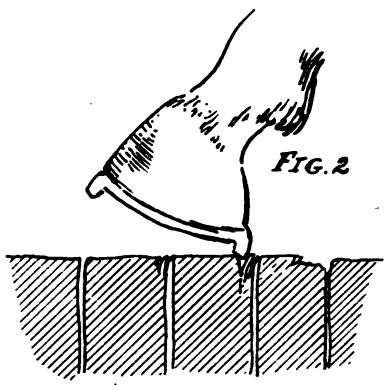

FIG. 2

portion until gradually the whole surface is cut away in patches. In the case of the transversely set blocks the whole unprotected edge of the block is presented for the blow; in the case of the diagonal blocks of the intersection, the calk can seldom strike the block fairly in the line of least resistance, and that is undoubtedly why the blocks of the intersection are in much better condition than those that lie between.

It may be argued that the only reason the edge of the block can be split off is because it is unsupported filler. True, that is the correct remedy, but in applying it we establish conditions even more ruinous.

All matter is subject to nature's laws and one of her most inexorable laws is that of expansion and contraction. It is this law that must be considered in constructing pavements of either block, asphalt, or brick. In Figure 3 is illustrated the effect of expansion upon wooden block pavements, or, more specifically speaking, that type of block pavement which is made of sawed rectangular pieces of wood. It is doubtful if any efficient method will ever be devised that will provide for the lengthening of the blocks caused by expansion. It is the effort of these blocks, elbowing each other, as it were, for more room, that causes them to rise from their base and form small mounds or hummocks at the points of least resistance. In some places curb, sidewalk and all are pushed back.

Various experiments have been tried with a view of discovering a remedy for this fault, but without avail. If the blocks are set loosely at first, with spaces between, it will not be a great while until the spaces are packed full and tight with the dust of the street sweepings which sift into them; then comes along a dry spell and each block contracts in size while daily the process of filling in with dirt the ever widening interstices continues; at last comes the penetrating all night rain and the hot sun of the suc-

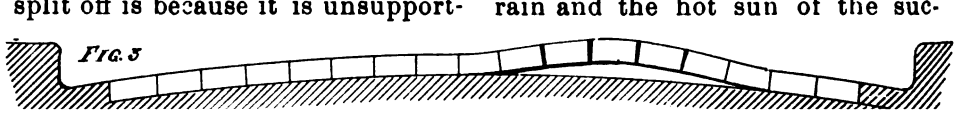

FIG. 3

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some of them, cut them down in size and replace, or wait until they dry out and drop back naturally.

In the creosoted block pavement, such as are at present being laid in Indianapolis, the blocks are driven as closely together as possible, in an endeavor to have each block back up its fellow against the destructive blow of the horse's foot, but this method, while causing a gain in one direction, makes loss in another, for the elasticity of the pavement is proportionate to the amount of yielding filler that may be had between the blocks. It is proposed that room for expansion may be provided by leaving room, between the outer row of blocks and the curb, for a filling of sand of the width of ½ inch, more or less; this, however, does not appear to be of much avail, for it soon packs into an unyielding body and is no more compressible than the block itself. The photographic reproduction which accompanies this article represents the surface of a street that is paved with pine blocks, creosoted; the blocks have been down about one year, more or less.

A consideration of the foregoing observations may lead one to the following conclusions:

1st. Wood pavements are destroyed by abrasion, not rot.

2d. Creosoting wooden blocks does not increase their power to withstand abrasion, although it may deter rotting.

3d. No reliable method has yet been devised to overcome the effects of expansion in wood pavements.

4th. Blocks set in lines diagonally to the line of the street will withstand abrasion longer than those set transversely.

AN ANSWER TO CRITICISMS OF CREOSOTED WOOD BLOCK PAVEMENTS.

By Clarence A. Kenyon.

[Mr. Clarence A. Kenyon, one of the ablest and most prominent advocates of creosoted wood block pavements, was accorded the opportunity by the editor of MUNICIPAL ENGINEERING of answering Mr. Hetherington's criticisms. Mr. Kenyon's answer is given below.—EDITOR OF M. E.]

In general, I assume that the foregoing article is intended as an argument against wood block pavement, and especially against creosoted wood pavements. This is evident from the statement that "none that has yet undergone the test of two years' service has proven satisfactory in all respects." The statement is merely the assertion of the writer, without offering any proof. No pavement yet devised may be said to meet all conditions. In that light, no asphalt, brick, wood or granite "is satisfactory in all respects." It is only fair to say that there is less complaint in Indianapolis to-day by the people on the creosoted wood pavements, of defects, than on either asphalt or brick.

The next complaint of the writer is that "wood pavements are destroyed by abrasion (or wear) and not rot." This is really wonderful, so wonderful, in fact, that he goes into great detail to explain just how wear takes place, as though wood pavement is the only thing in this world that wears out. Of course wood pavements wear out; so does asphalt, brick, granite, and so would Harveyized steel. The practical question, it would appear, is

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not, will pavements wear out? but which kind will wear out first under similar conditions of traffic, a subject on which the writer says nothing. He commits the fallacy of arguing from a special case to a general one. For example, he observes that Washington cedar (a soft, spongy wood) is wearing faster on Meridian street than it is rotting, and conveys the impression therefrom that all wood pavements will wear the same way. That might be an argument against that kind of wood, as the use of a poor asphalt which quickly disintegrates would suggest the discontinuance of the use of that particular kind of asphalt, but it is no argument against the use of wood or asphalt as paving materials.

It is a matter to be regretted that Indianapolis, like most other cities, has laid some pavements, without a proper selection of material; we have had some poor asphalt pavements and some poor wood pavements, and some poor brick pavements, but these facts by no means prove that good pavements can not be laid with wood, asphalt or brick. Good ax handles can be made of wood, but a good ax handle can not be made of a pine stick, and yet a wood as inappropriate for a pavement as pine would be for an ax handle was laid on Meridian street. Washington cedar is a soft, porous, spongy wood with little strength of fiber, and yet, surprise is shown that traffic wears it. It had never been used before as a paving material. Why Indianapolis should be the pioneer with Washington cedar, no one knows.

Another point made in the article is that "blocks set in line diagonally to the line of the street will withstand abrasion longer than those set transversely." The idea is not new. It is a part of the Indianapolis specifications. Stone and brick pavements are often laid that way both in this country and in Europe.

Again, the writer of the article says that "creosoting wooden blocks does not increase their powers to withstand abrasion, although it may deter rotting." Our government officials have not determined the question which the writer so quickly disposes of, but I quote the results of Dr. Boehme's experiments from Bulletin No. 9, of the Department of Agriculture, p. 227: "Tests of bending strength of the samples showed that those impregnated were stronger by 15 per cent. Resistance to compression was greater by 22 per cent. * * The following results confirming this view are taken from some experiments which were submitted to the British Civil and Mechanical Engineering Society some time ago." Then follows the table of experiments confirming Dr. Boehme's statements.

Howard Constable, C. E., in summing up the experiments of the department, in the report above referred to, says, at page 279, "Preservation, however, materially adds to the natural hardness of timber."

His next point is that wooden blocks expand and contract, by an inexorable law of nature, as does asphalt and so does brick and he might have added, all other matter, but he is ignorant of present knowledge and even anticipates the future by saying, "It is doubtful if any efficient method *will ever* be devised that will provide for the lengthening of the blocks caused by expansion. * * Various experiments have been tried with a view of discovering a remedy for this fault, but without avail." We can provide for expansion in brick, stone and steel construction, and

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yet, in all of them, the expansion is much greater than in wood. It is now claimed that by means of a binder the expansion of asphalt is largely taken care of, and waves prevented. Wood is more universally used in construction than any of these materials; the expansion is very slight and is taken care of without the least trouble in all kinds of wood structures. It will be interesting to learn just why it failed and everybody failed, and will in the future fail, to find an efficient method to take care of the expansion of wood when laid with rectangular blocks in a pavement. The statement of the case ought to disclose the error or ignorance of the writer. As a matter of fact, his information is not correct.

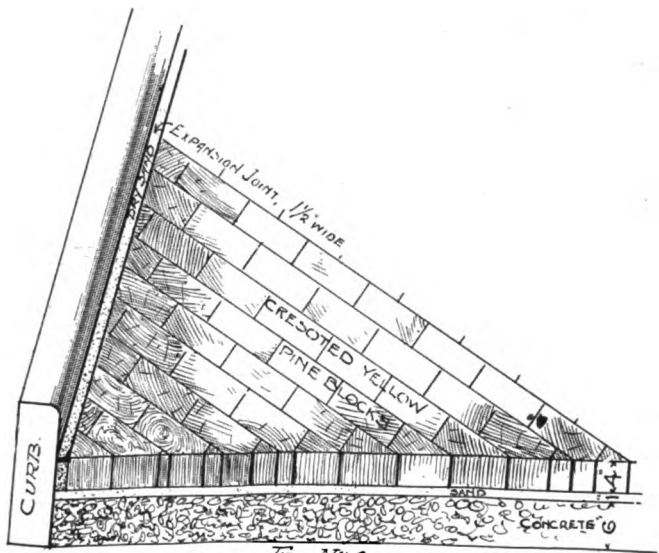

Fig. No. 1

There are several known ways to take care of the expansion. In Galveston, Texas, where they have large areas of creosoted yellow pine pavement, wedges are used. I quote from a letter of City Engineer Peek, under date of July 18, 1898: "We have five blocks of creosoted pine pavement * * * laid in 1874. This pavement, except where it has been broken into by double track street railway down the center, and in some places by excavations for gas and water pipes, is in very good condition to-day. This pavement was laid with properly creosoted blocks and *wedges*." That is at least one way, but the simplest way is by leaving a space between the blocks and the curb, of, say an inch or an inch and a half, as is done in London and in Paris. I quote from the London specifications for the paving of Pembridge road done in 1895: "The margins (1½ inch wide), for expansion left between the wood and granite curbs, to be filled with clean, dry sand and coated over with a film of Portland cement," in the manner indicated in figure No. 1. The method just described is the method practiced in Indianapolis, but prior to this year, there was no provision made for expansion, and, indeed, unless the blocks are laid very close together, there is no necessity for it, as the expansion of creosoted wood is slight.

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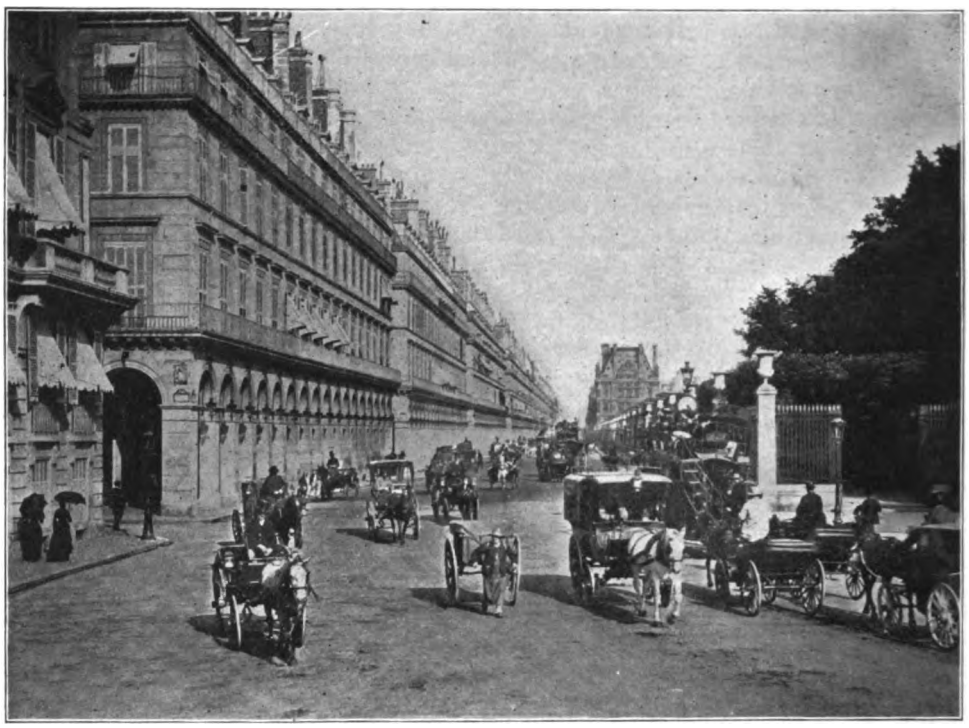
But the contributor says that the method above described "does not appear to be of much avail, for it soon packs into an unyielding body and is no more compressible than the block itself." Where he gets the information to justify that statement, he does not say. He cites no case where a pavement so laid has raised up, and his statement that dry sand will pack itself into an unyielding body by the lateral pressure of expansion, is hardly convincing. One might assume that the pavement in the picture he presents, had the expansive joint above described, for anything in his article to the contrary, but a careful examination of the specifications providing for the paving of that street shows that the pavement was not so constructed. Neither was it pine, as stated, but Washington red cedar.

The accompanying illustration is from a photograph of the Rue de Rivoli, in Paris, the street through which passes about 42,000 horses per day, more than any other street in the world. It is paved with yellow pine blocks creosoted, and the joints are so tight that they can scarcely be seen in the original picture. I was informed that the pavement was about seven years old when the picture was taken. The expansion joint above described was provided, and the officials informed me that they had had no trouble from that source. There are hundreds of miles of these pavements in London, Paris, and other European cities, and they are being extended every year; in fact, more than any other kind of pavement. I heard no complaint made that there was any difficulty in providing for the ex-



WOOD BLOCK PAVEMENT ON RUE DE RIVOLI, PARIS.

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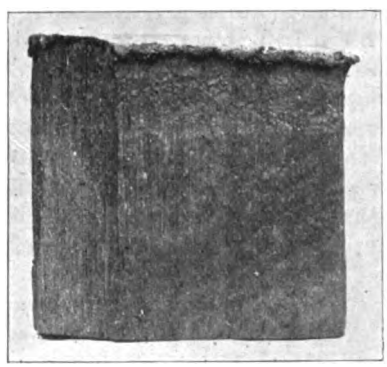
pansion. The fact that wood pavements have been in vogue there for over thirty years, and are increasing in popularity, would not suggest that any engineering difficulties had been encountered that had not been overcome.

The Londoners and Parisians are in favor of wood pavements, but not the kind that have been current generally in this country, consisting, as a rule, of round, green blocks, with the sap-wood left on, and often the bark, laid on sand or boards, with gravel in the interstices, the wood of which usually co sisted of soft, white cedar that is no more appropriate for a street pavement than a soft brick is for a brick pavement. Is it any wonder they rotted out and wore out? Houses and furniture constructed of such material would be no better than the pavements. But when our government reports show that long-leaf yellow pine is stronger to resist loads and abrasion than oak, and there are several other woods nearly as strong,* it is fair to assume, that, if it did not rot, traffic would not break off the corners in the manner described in the article, with Washington cedar. The accompanying illustration is from the photograph of such a block, creosoted, that was taken out of the center of the roadway in Market street, Galveston, Texas (the main business street), after twenty-two years of wear. It is worn down about one-half an inch, and it will be noted that the traffic did not chip off the corners as described in the preceding article. The reason that the blocks were not so chipped is that the wood was appropriate for the use intended and strong enough to withstand the traffic. In New Orleans there is a section of creosoted yellow pine alongside of a granite pavement, at the entrance of the New Orleans gas-works, under heavy traffic for twenty years, and the granite is worn more than the wood.



CREOSOTED YELLOW PINE PAVING BLOCK FROM MARKET STREET, GALVESTON, TEXAS, AFTER 22 YEARS WEAR.

That treating wood with the heavy oil of coal tar (creosote) preserves the wood from decay, is too well established now to be a matter for contention. Heretofore, the process has been so costly that its use was almost prohibited.

All of the matters that the article complains of that can be said to be objections are matters that proper engineering will provide for. The

*Result of experiments of Department of the Interior, from "Report on the Forests of North America":

	Transverse Strength.	Resistance to Longitudinal Crushing.
	Kilograms.	Kilograms

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nored. The days of cowhide boots and stone pavements have passed. Comfort and pleasing conditions must now be consulted. It is the latter that appeals for wood pavements, on account of their pleasing appearance, cleanliness, freedom from blinding glare, noise and fine dust. Ask any transfer or livery man and you will find them all in favor of wood pavements.

Wood pavements are a great saving on horses. Loads are more easily hauled over a smooth wood pavement (and they should be laid in no other way) than any other kind. They are more easily and cheaply cleaned than any other pavement. When a wood adapted to the traffic of the street to be paved is selected, properly seasoned, and properly treated with creosote, and laid properly, I believe that such a pavement is as enduring as granite, proper attention being given to repairing. It will not be perfect. There is no such thing. I know of no case where such a pavement as I have described has proven a failure or has had the verdict of "not satisfactory" passed against it, and I do not believe that a well authenticated case can be shown. But green, soft, sappy wood improperly creosoted are errors of engineering and not of material. Now to say that a material which has been used in almost all kinds of construction for thousands of years can not be successfully adapted to street paving, when it has so many desirable qualities for that purpose, would be not only belying history, but a sad commentary on the engineering talent of this or any other country.

MR. HETHERINGTON'S REPLY TO MR. KENYON.

To the Editor of Municipal Engineering Magazine:

SIR—I have looked over the article which Mr. Kenyon has written in answer to my own concerning wood block pavements, and wish to say that it was not my purpose, in giving out the result of some personal observations, to challenge any advocate of that kind of a pavement to a discussion, nor shall I permit myself to be led into one of those profitless arguments that lead to nothing in particular. My article plainly states that it deals solely with the wood block pavements as known to the citizens of Indianapolis. I am not prepared to dispute any assertions made concerning any superior kind of wood pavement in some far away land, well beyond my reach. What I have said concerning the Indianapolis streets is susceptible of absolute proof. If they are deficient on account of faulty engineering, as Mr. Kenyon seems to wish us to understand, that is "another story." I have considered them simply as they are to-day. To a few of Mr. Kenyon's statements I have to say as follows:

First. I drew attention to "the wonderful fact" that wood pavements are destroyed by abrasion instead of decay, simply because the principal argument of the creosote advocates is that creosote prevents decay. I have not yet learned that it prevents the results of abrasion.

Second. I made no statement that the blocks of Meridian street are wearing out faster than they are decaying. I think it is plainly

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enough stated that it is not decay that is the matter with them; therefore, they would be no better to-day even had they been creosoted.

Third. Concerning the matter of "axe-handles," I am not considering it; I am discussing street pavements.

Fourth. It is not contended that the setting of blocks diagonally is new. The argument is rather that one of the main reasons why our new wood block streets are better than the older ones is by reason of the builders taking advantage of the fact that blocks last longer when so set.

Fifth. As to the matter of the government's tests of "bending strength," etc., I have to say that these tests have nothing to do with the case at issue; the said tests were made to determine the efficiency of wood for other purposes than paving, in which "bending strength" cuts no figure.

Sixth. As to the matter of the comparative expansion of "asphalt, stone, iron or wood," I have to say that any child knows that of all these named materials wood is the only one that is perceptibly influenced, in the way of expansion, by water. It is said that there was among the quarrymen of ancient days a method of splitting huge blocks of stone by driving wooden wedges into a deep channel cut into the stone in the direction in which it was desired to split the block. After the wedges were driven in tight the channel, or trench, was filled with water; the wood blocks swelled and the rock fell apart. Would iron, stone, or asphalt blocks have answered this purpose?

Seventh. I made no statement that "dry sand will pack itself into an unyielding body;" I have not been considering *dry* sand; I speak of wet sand and wet blocks. It must be also remembered that the sand filler will not long remain pure sand; that it soon becomes mixed with the fine dust of the street, which may be more or less of a clayey nature. True, the sand of the 1¼-in. filler, which Mr. K. advocates, might be protected by a coating of Portland cement, and thus kept clean and dry, but when the expansion of the blocks occurs again what will happen to this cement roof over the sand pile?

Eighth. I have no reply to the statements as to what is done in London and Paris; these are the bugaboos always held up as clinching arguments. Some day I will go over and see about it; at present I am discussing only the pavements of Indianapolis.

F. A. Hetherington.

IMPROVEMENTS IN WATER-WORKS OF AMERICA.*

By Alphonse Fteley, President of American Society of Civil Engineers.

The number of places in the United States now possessing a public water supply, whether under public or private ownership, is nearly 4,000; but, while systems of works increase in number and importance, it would seem that we lack in this country the faculty of properly regulating them as regards the quantities to be furnished. In large cities, with some exceptions, the per capita consumption is in-

*From annual address to American Society of Civil Engineers at Detroit, July 26.

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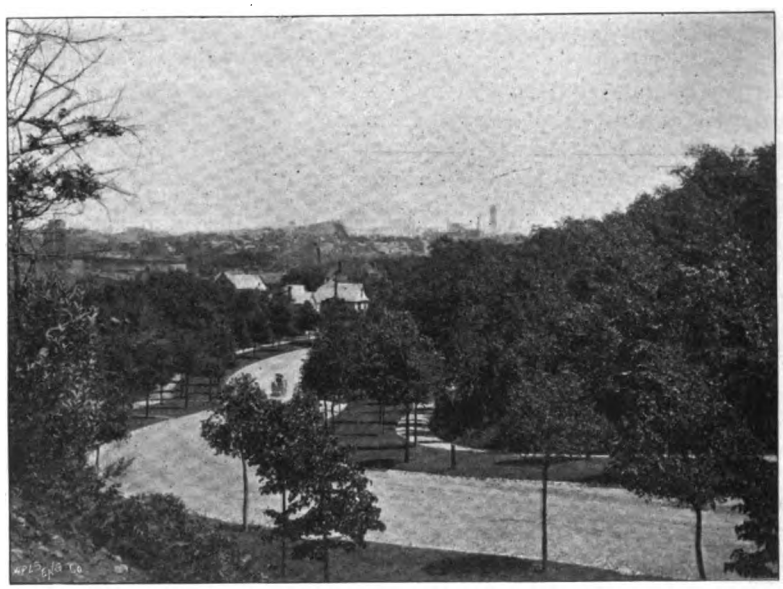
creasing, and in several of them the amount consumed attains absolutely inordinate proportions, although, in some of them, every gallon of it has to be pumped. The old cry that water in our communities should be as free as air is heard from people, who from their intelligence and business habits should know better, and the taxpayer does not stop to think of the result of extravagance in water consumption. More water means more and larger pipes, more capacious reservoirs, more pumping stations, and, in many cases, new sources of supply, with the attendant large outlays necessary to procure them. It also means increased risks. In some cases, as in New York, it becomes a problem to

extended system of making consumers pay for the amount of water actually consumed, and clumsy and inaccurate methods of estimating the amount and value of the water used are resorted to, which not only would not be tolerated for the sale of other commodities, but would be considered absolutely ridiculous.

The consequences of excessive consumption of water are ominous. Take the case of New York. In 1890 its new acqueduct was put into service, the consumption then being 110,000,000 gallons per day. After nearly eight years, the average for 1897 was 230,000,000 gallons per day, a per capita rate of about 115 gallons. At this rate the new system of water supply begun over ten years ago,



KENWOOD PARKWAY, MINNEAPOLIS.

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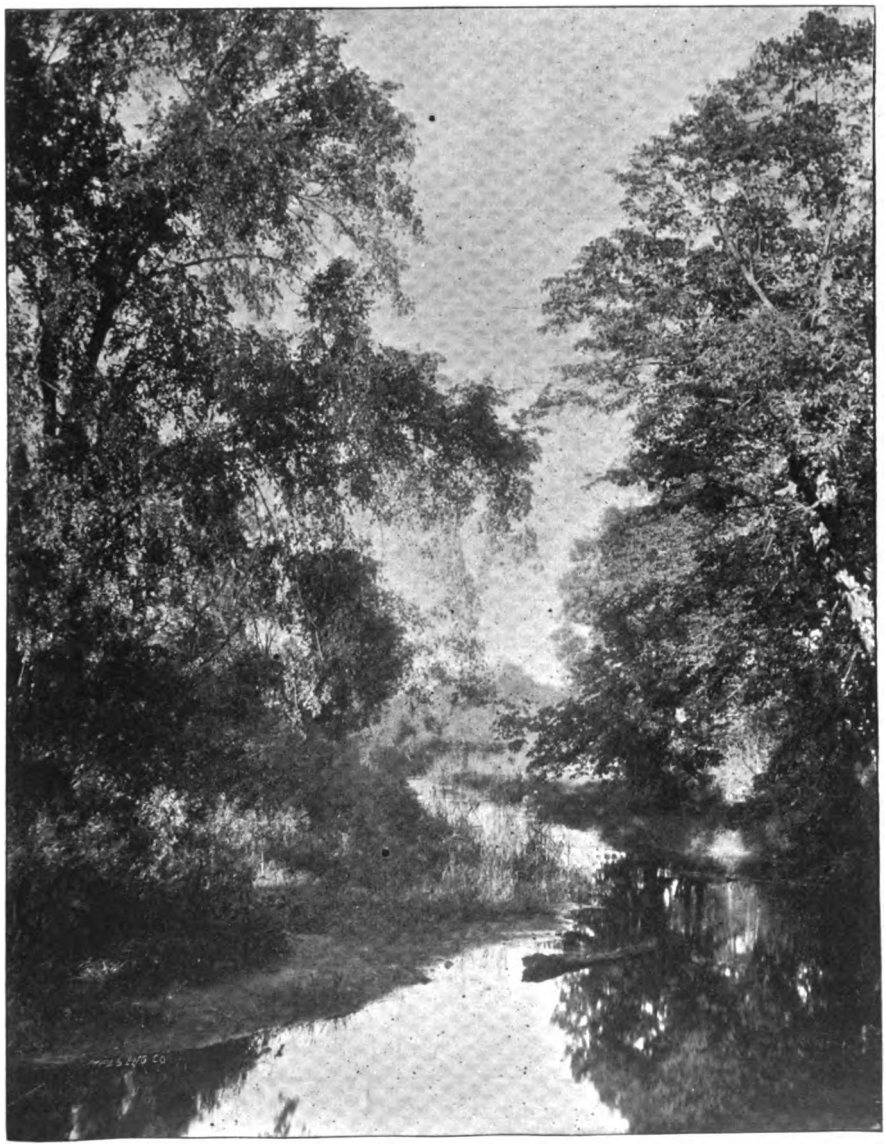

A GLIMPSE ALONG MINNEHAHA PARKWAY, MINNEAPOLIS.

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no fresh water within easy reach, have generally taken too great risks in the matter of their water supply, and it is to be wondered at that no harm has resulted from this policy; those especially where the density of the population is great should have more than one system of water supply, and it is to be hoped that this view of the subject may be adopted.

With the advance of sanitary science the need of purer water has been felt, and efforts have been made in many directions to improve public water supplies. Where they are obtained by impounding river waters in storage reservoirs formed by damming the streams, great inconvenience has been felt from offensive tastes and odors, generally produced by the development of microscopic vegetation. Efforts have been made to improve the gathering grounds and the reservoirs, and in a number of cases, especially in and about Boston, the soil, down to the underlying sand and gravel, has been removed at a large expense, to the great benefit of the impounded waters. In cases where the same inconveniences have been experienced in underground waters pumped into reservoirs exposed to the light, a notable improvement has been produced by covering the reservoirs.

Much attention has been given in late years to the study of filtration processes. Thirty years ago an eminent member of this society, and one of its late presidents, prepared, for the benefit of the St. Louis waterworks, a report on "Water Filtration," which, for many years, was the most valued text-book on the filter was to retain the particles suspended in the water, very little action taking place on matters contained in solution. Little was known of the influence of filters on bacterial life. Within recent years, however, especially through the efforts of the Massachusetts State Board of Health in conducting at the experimental station at Lawrence its well-known series of experiments, results have been obtained which have revolutionized the theory of water filtering. Radical chemical and biological changes have been found to take place in the operation of filtering, and bacterial life has been recognized as the most potent instrument for the conversion of organic matters into mineral compounds, while it operates at the same time as an agent of almost complete self-destruction, provided, of course, that the construction of the filters, the selection of the filtering materials used and the subsequent care of the apparatus are such as to properly carry out the results indicated by the laboratory experiments.

A number of different materials have been recommended and used as filtering media with varying success; the most extensively used have been sand and gravel. Sand filters have been in use in Europe for many years, long before the full measure of their usefulness was known, and the modern applications of the system have been highly instructive. We all recollect the striking results of the differences in mortality in Altona and Hamburg during the recent epidemic of cholera, when the first named city, with a water supply polluted by

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A FOUNTAIN IN LOGAN PARK, MINNEAPOLIS.

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corded. No large systems of what may be called gravity sand filters exist in America, but important communities have been recently and are now making extensive experiments with a view to building some, and in one instance at least, in Albany, a system of filters on a large scale is now under construction.

In mechanical filters, in which various filtering substances, mainly sand, are used, coagulants are generally used to eliminate a large portion of the organic and other matters contained in the water, and sufficient pressure is applied to force the water through the filtering medium so as to cause a flow of water larger than through gravity filters, per unit of area. They have been used for years and have recently been so perfected as to be reported by their inventors as capable of successfully competing with gravity filters in cost and in efficiency. Two very important series of experiments have been made by large cities to investigate the merits of the mechanical filter. Further developments and added experience will evidently be needed to decide the question. From reports made by capable experts in behalf of communities in search of advice for the purpose of constructing filtering apparatus, it appears that the choice between the two systems, in many cases, must be determined by local circumstances, depending mainly on the cost of the filtering materials and on the quality of the water.

The public appears to realize now, more than ever, the desirability, if not the absolute necessity, of procuring purer water, and the close connection between pure water and improved public health is better understood by public bodies. From an economical standpoint alone, when considering the commercial value of each human life, the saving effected by diminishing the mortality would represent a large capital.

Construction has been favored by the decreasing price of iron and steel. The price of cast-iron pipes, especially, has been never so low as it is at present. Steel riveted pipes, for the conveyance of water from the source of supply to the point of consumption, in recent years, have been introduced more liberally in the east. For long distances, with large diameters, under heavy water pressure, especially when few connections have to be used on the way, these pipes are as much superior to cast-iron pipes as the steel substitute is to the old cast-iron tension member of a bridge, and it is not doubted that they will be ultimately used to the exclusion of others, but, unfortunately, although similar pipes made of wrought iron have been successfully used for years on the Pacific coast, and elsewhere, it can not be said that the coatings used to preserve the metal from oxidation are entirely satisfactory. The rivets used for fastening the pipes and lapping joints impede the flow to a certain extent, and a pipe has been devised, the fastenings of which are entirely outside, and provide the pipe with a smooth bore. The great improvement in steel-welded pipes of large diameter will also remedy that defect to a large extent. An order is reported of several thousand tons of welded pipes to be made of Siemens-Martin mild steel, 24 feet long and 42 inches in diameter, for the Birmingham water-works. The possibilities of steel pipes are well illustrated by the proposition to convey a much-needed supply of water, of 5,000,000 gallons per day, to a mining district of Western Australia, by means of a pipe 30

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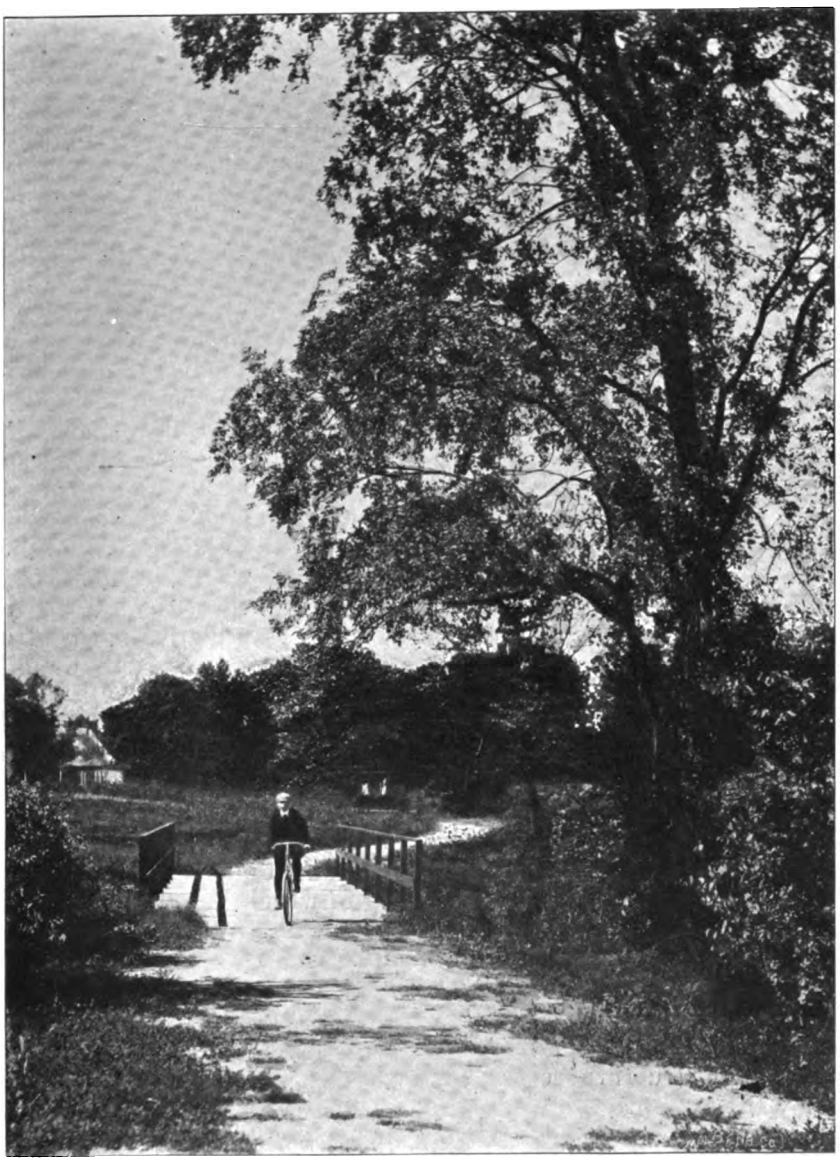

A VIEW OF THE BICYCLE PATH IN MINNEHAHA PARK, MINNEAPOLIS.

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inches in diameter and 328 miles long.

The construction of water-works and of irrigation works has rendered necessary, in recent years, the erection of many dams for the impounding of water, a number of them being of great height. Few new principles of construction have been introduced, but improved methods for the building operations have been resorted to, thereby reducing the ultimate cost and the time necessary for the completion of the structures.

The solid stone masonry section, on the general plan originally introduced by the French engineeers, has been accepted in many places; the general practice now being to use large stones with the necessary filling of spawls instead of the uniform small-stone masonry formerly adopted and even recommended by eminent engineers. Elsewhere, concrete masonry has been adopted, this course being generally indicated by local circumstances, such as the high cost of, or even the lack of, stone in the vicinity. In recent instances of concrete dams slight vertical cracks have developed which have been less frequently found, if at all, in well-built stone masonry, owing, probably, to the more thorough bonding of the mass by means of the interlocking of heavy stones. In the western part of the United States rock-filled dams have been built, the imperviousness of the structure being provided by the construction of [illegible] walls. A peculiar core, formed of thin sheet iron, used in connection with a recent rock-filled dam in California, is worthy of notice, if not of imitation.

It is to be regretted that theoretical calculations can not be accurately applied to the computations of the stability of dams. The distribution of strains through such masses is not well known; moreover, the diversity of the materials used, the unavoidable lack of uniformity in the labor employed, the different times of the year in which the work is performed under varying temperatures, are all elements which can not be accurately analyzed, although they can be provided for by the introduction of the too often necessary margin of safety. Experience must here come to the rescue of the designers, and dictate the necessary precautions to be used in accordance with known precedents. Especially is this true of the designing of earth dams, for which, in almost every instance, a careful study must be made of the particular materials at hand for construction

The uncertainties just alluded to have been eliminated in the design of a dam of moderate size, the building of which has been recently reported. It is formed of steel columns and struts reposing directly on the bottom of the valley, the up-stream side being formed of steel plates rendered water-tight by the application of a bituminous coating. It [illegible]

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A VIEW OF THE "THREE DRIVES," NEAR LAKE CALHOUN, MINNEAPOLIS.

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was completed in 1893, under exceptional difficulties, for irrigation purposes. The dam built for the water-works of the city of Remscheid, Germany, was also recently erected. In the masonry dam of La Tache, in France, the old French practice of using such small stones only as two men could carry has been continued, although convenient quarries were at hand. The new Croton Dam for the water-works of New York, to be of masonry and earthwork, a structure of great height and involving the laying of over 600,000 cubic yards of masonry is well advanced.

In the states of California and Arizona especially, a large number of dams, mostly for irrigation purposes, have been recently completed or are being erected. The Upper and lower Otay dams, one of them provided with a thin steel core, are important in size. Several masonry dams in Arizona, of great height, may be mentioned; one of them to be 250 feet high above foundation, and to form a reservoir of the enormous capacity of 1,020,000 acre-feet. La Mesa dam, in California, was built with materials transported and deposited in place by flowing water, by the process known to miners as "ground sluicing." Another, to be 130 feet high, is expected to be built by the same method. The Louisa Needle Dam, built for the regulation of the Big Sandy River, Kentucky, recently completed, is remarkable from the fact that it sustains a head of water which considerably exceeds that supported by any other dam of the trestle or wicket type yet constructed.

As the needs of water supply and irrigation call for higher dams, the reservoirs formed thereby are obviously increasing in size, and figures are now being reached as to reservoir capacities which recall the size of the great ancient reservoirs, the knowledge of whose existence has been transmitted to us by tradition, if not by history. The idea of the restoration of the great compensating reservoirs of the Nile, spoken of some time ago, does not appear to be any longer entertained, but the erection of two dams across the river, with a proposed storage of 266,000 million gallons, for the purpose of regulating its flow, is now being seriously contemplated, if not already started. The system of compensating reservoirs for the Mississippi Basin is well under way.

VIEWS OF MINNEAPOLIS PARKS.

Some new views of scenes in and near Minneapolis parks, obtained through the kindness of Mr. Frank H. Nutter, city park engineer, appear in this number. that the city has up to this time not been able to purchase or improve. A small tract of ground was added during the last year, and some minor improvements have

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SUMMIT OF KENWOOD PARKWAY, MINNEAPOLIS. LAKE OF THE ISLES AND LAKE CALHOUN IN THE DISTANC

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Elliott, Fairview and Powderhorn parks, is enough for the present needs of the city, but the great plan originally devised by Mr. Cleveland, the landscape architect, should be carried out by the city.

STREET LIGHTING AT MUNICH WITH INCANDESCENT GAS LAMPS.

Some information is furnished by Dr. E. Schilling, in an article in the *Journal für Gasbeleuchtung*, regarding public lighting of Munich, capital of Bavaria, with a population of about 250,000, by means of incandescent gas lamps. He says that, owing to the principal thoroughfares of the city being lighted by electricity, the higher grade of illumination thus produced made it almost obligatory that in the neighboring gas-lighted streets the lighting effects should be heightened. In consequence, the municipal authorities determined that all public lamps should be furnished with incandescent burners. The beginning was made in the spring of 1897, and all the gas street lamps, of which there were 5,015, were equipped by October 1st of the same year. This made it possible that, between the latter date and April 1st, 1898, by close observation a pretty accurate idea could be had as to the cost of the system on a large scale; and especially the cost of operating and maintaining the same.

The principal item of expense was found to be the mantles, and that, indeed, had the greatest influence upon the total cost. Before inaugurating the incandescent gas system of street lighting circular inquiries were sent to a number of

The replies received gave all the way from 2 to 15 as the number necessary. "Doubtless," remarks the author, "the quantity used is affected somewhat by local conditions, according as there may be more or less traffic on a street; or as perhaps the lamps may be supported, either on posts or on brackets fastened to the walls of adjoining houses; or as the attendance may be good or indifferent. But under normal conditions such differences as those mentioned can scarcely be thought to exist. * * * We found, however, that in calculations with reference to this sort of lighting, five mantles, on the average, should be figured on as required per year. That number includes the original mantle put in with the first installation."

The author then goes on to say they found that a trifle more than 2 chimneys and 4½ mantle-holders per year would be the average used for each lamp; and this, whether the lighting was only half or all night. To operate and maintain this plant of 5,015 burners required the services of 1 superintendent, 9 mounters and 12 helpers.

"On the whole, the streets were much better lighted than when the old slit-burners were used; and, in fact, the illumination compared favorably with the electrically-lighted

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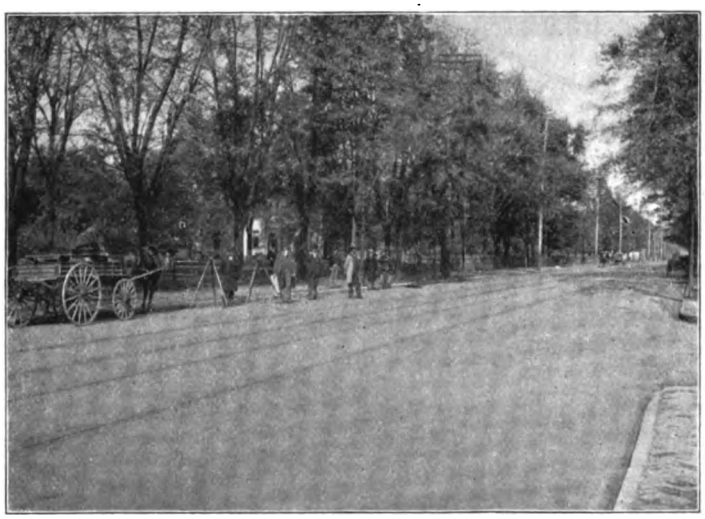
GARBAGE DISPOSAL IN DETROIT.

Dr. Walter Kempster, health commissioner of Milwaukee, in his annual report, gives a description of garbage disposal at Detroit by the reduction process controlled by the Detroit Liquid Separating Company, as follows:

At the present time the amount of garbage collected and disposed of amounts to about seventy tons per day, which rapidly increases during the summer season to over ninety tons per day. The garbage is being collected either daily or twice or three times a week, according to the districts, in close, water tight, iron boxes, similar in form to those used in Milwaukee, each having about one and a half tons capacity. These boxes when full are delivered at the stable and sheds of the company, located in the southwestern part of the city, near the railway tracks. Here each load is weighed, after which, by means of a traveling crane, the boxes are raised from the wagon trucks and transferred to flat cars, constructed to receive these boxes in two tiers of ten in each tier. On the average three such cars are loaded each day, except Sundays; they are switched out by the railway company during the night and delivered next morning at the disposal plant, about twenty-two miles distant from the city.

The boxes were kept closed and the garbage left undisturbed there-



NORTH HIGH STREET, COLUMBUS, O., PAVED WITH ASPHALT.

in, no offensive odor was noticeable at the shed where the boxes were transferred from the wagons to the flat cars and were allowed to remain until night. As each wagon is relieved of its box, an empty box, previously washed, is placed upon the trucks and the same is ready to be sent out upon its trip of collection. The company owns all wagons, boxes, cars and horses.

At the disposal plant, situated at French's landing, where the Wabash railroad crosses Huron river, the boxes are lifted from the flat

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cars and conveyed by a traveling crane to the top floor of the works, where the garbage is dumped on the floor and then shoveled by hand into the top of steel digesters, or cooking tanks, until these are filled.

There are nine of these tanks, each of about five tons capacity. These digesters consist of vertical, circular iron tanks, with an opening at the top to receive the garbage, which opening, when the digester is filled, is securely closed by an iron plate firmly screw-bolted down to the tank. The bottom of the tank is somewhat cone-shaped, a short distance above which a discharge opening is provided through the side of the tank. Below this opening and extending across the tank is a perforated false bottom. Within the tank and resting upon this false bottom are three separate cylinders, having double walls, closed on top, open at the bottom and perforated at the sides. The larger cylinder is very nearly the diameter of the tank. The next one is somewhat smaller than this one and is situated inside of it, and the last is still smaller, situated inside of the second cylinder.

After the tank has been filled and closed, steam is turned into the tank and the garbage cooked for a period of six hours, thoroughly digesting the same. During the cooking process, steam and gases are allowed to escape through a pipe from the top of the tank and are condensed by means of cold water, sprayed in a pipe and conveyed thence into a barrel, from

pleted, steam at a pressure of 80 pounds per square inch is forced into the tank from above and also from below. The liquid from the garbage is then forced out by means of the steam through a pipe under the perforated bottom. The steam pressure is continued on the tank for a period of four or five hours, during which time nearly all the liquid and grease are squeezed out of the material, leaving about 30 per cent. of the original garbage in weight in the tank. This material, called tankage, is withdrawn through the side opening to the floor and is conveyed by wheelbarrows to an upper floor, where it is shoveled into steam jacketed dryers, in which the material is further dried for about two and a half hours, leaving about 15 per cent. of the original bulk in a dry, homogeneous, brown mass. From these dryers the material is taken to the mills, ground up, screened, and then stored in the sheds as a fertilizing material. The material drawn from the digesters, after having been pressed, has a slightly sweetish, though inoffensive smell, similar to the steam vapors in a kitchen. The pressed-out water and grease are separated by means of separating boxes, the grease collected in a barrel and the water run off as a dark brown effluent into the Huron river. This effluent rapidly colors the water in the river and, though it may not be objectionable on sanitary grounds, yet is highly objectionable because of its color.

The special features to be recommended at Detroit are the methods of collecting and transporting the

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THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

DISCHARGE OF WATER PER HOUR FROM DIFFERENT SIZES OF PIPE.

A water pipe is 3,000 feet long; inside diameter for 200 feet is 6-inches; 2,800 ft. is 4-in. Water enters 6-in. pipe under 6 feet pressure; pipe has fall of 64 feet in the 3,000, is smooth and not corroded. What quantity of water should it discharge per hour?

Where can I secure a book of tables answering such questions?

What is the simplest formula for calculating such discharge with reasonable accuracy. *I. C. Clark, Kent, Wash.*

Two recent books answering such questions are Freeman's "Graphical Solution of Hydraulic Problems" (Wiley, $2.50) and Weston's "Friction of Water in Pipes."

Freeman uses the formula:

$Q = Ac\sqrt{rs}$.

A being the area of pipe,

c an empirical constant,

r equal to one-fourth the diameter of the pipe, and

s the head in feet divided by the length of pipe.

Weston uses the same formula, except that he has derived an expression for c which fits the observations he has made very closely.

The tables in Mr. Weston's book will give the discharge under the conditions stated above at more than 175 gallons a minute, or 10,500 gallons an hour, but not so much as 180 gallons a minute.

Bad condition of pipe, and bad profile of pipe line would both reduce this flow.

HOW TO STOP THE LEAKING OF A WATER PIPE.

Which would be the best way to keep a pipe from leaking until I could get a lead joint run?

James Baker, Palouse City, Wash.

A method which works fairly well is to wrap the joint with several turns of rope, taking pains to have the turn next the joint in such position that it can crowd against the leak, and so arranging the other turns that when a rod is put in the slack and twisted, these turns will force the first turns hard against the joint. Each pipe foreman has his favorite method of solving this problem and we should be glad to publish descriptions and diagrams of such as are simple and successful.

ELIMINATION OF IRON FROM WATER.

We get water from the Missouri river bottoms from wells sunk to bed rock, and it is clear and cool, but has much iron in it. What is the best method to get the iron out of the water?

Wm. Pickering, Richmond, Mo.

The best method in any particular case can be determined only by careful chemical examinations of the water under all its various conditions. If the water is clear when pumped and afterwards leaves a reddish deposit, it is probably due to the presence of soluble compounds of iron which are made insoluble by absorbing oxygen from the air, or to the presence of a small amount of iron and of crenothrix, a water plant, which thrives in such water. In the former case thorough aeration followed by sand filtration will improve the water. In the latter case filtration at the works might be sufficient unless it were not complete, or were done too promptly after pumping, in which case further growth of the plant might take place in the mains. Filtration at the time and place of use is most satisfactory in such case, preceded by aeration there or at the works if found necessary. For any purpose except laundry, or some manufacturing operations the aeration may be sufficient in the former

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case. The iron in water from such sources is usually from organic sources, and the amount may vary with the supply of water and of organic matter to the vein. It may therefore be necessary to vary the treatment from time to time.

LAYING PAVEMENTS OVER RECENTLY-MADE SEWER TRENCHES.

Will you be kind enough to refer me to any literature bearing upon, or quote specific instances of the evil effects of, laying pavements over recently-made sewer trenches?

Alexander Potter, New York City.

There is little literature on this subject. There are many short references to the methods of entering pavements with trenches in city engineers' reports—*e. g.*, Indianapolis, Jan. 1, 1895. Most engineers have, however, recognized the impossibility of a new pavement producing such conditions that can be laid on ground entirely undisturbed, and now limit their efforts to securing as thorough filling of trenches as possible. Experience has shown the possibility of securing such good work in filling trenches that, with the concrete foundations now demanded, the number of defective spots due to unequal settlement is reduced very nearly to zero. There are exceptional soils where this result can, perhaps, not be attained, but there are very few instances of this sort. A long training, to be obtained only in a large city with many pavements and much work, seems to be necessary to teach the methods of filling trenches thoroughly. No proper methods of filling trenches. Various materials require various methods, and all demand thorough work. Time will be spent better in teaching the art of filling trenches than in arguing for the postponement of construction until trenches have settled.

Poorly filled trenches settle for months, and sometimes for years, so that no safe time for beginning the pavement can be set. A heavy roller properly used will find the defective trenches more surely and more quickly than natural settlement.

See first-class city specifications for plumber's openings of streets for methods. Two interesting papers and discussion before the New England Water-Works Association will be found in the journal of that body for March, 1898.

CONCRETE ARCH FOR HEAVY TRAFFIC SIDEWALK.

Would it be practical to construct a concrete arch, say 20 feet long, and 5½ feet span, with a finished or a corrugated top surface, over a portion of a sidewalk that would stand the traffic of a two-horse steam fire engine? Would a half or quarter circle be better?

Dickerson Paving Co., Chester, Pa.

Unquestionably such a construction would be practical, either wholly of concrete or with a combination of concrete and steel. Either a quarter circle or a half circle can be used, proper care being taken to design the abutments of the arch and its thickness. A competent civil engineer conversant with the details of the location

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[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

ASPHALT PAVEMENTS, KINDS AND QUANTITIES.

How much Pitch Lake sheet asphalt, and how much of other kinds, and of brick pavement, are laid in the United States? In other words, is more Pitch Lake asphalt being laid than any other kinds of asphalt and brick put together? Does Sicilian rock last longer than Pitch Lake? Which costs the most? Which is the easiest repaired and replaced? Which looks best thereafter? You may think it strange that I ask these questions, but I have been trying to have New Haven lay some asphalt pavements. We have two or three miles of Sicilian rock pavement. Some people are dissatisfied with it. The present street committee have recommended Sicilian. I want them to lay some Pitch Lake. *B. C. F., New Haven, Conn.*

There exists in the United States about 1,500 miles of Trinidad Lake asphalt pavement laid by about thirty different paving companies and contractors. The asphaltum or mineral pitch is about 4 per cent. of the material used, including the foundation, or about 15 per cent. of the surface mixture. The gritty nature of the pavement is due to about 80 per cent. of sand in the mixture, the balance being powdered limestone or its equivalent. There are other lake asphalt pavements made on the same general formula, the asphaltum of which comes from various places in Venezuela, California, etc. Some of these pavements are excellent, others inferior, not always due, however, to the kind of asphalt used, but to errors in manufacture. The total amount of these other pavements is more than 400 miles. The asphaltic limestone pavements, known also

Both pavements, when properly laid, are durable. The first cost of the lake asphalt pavement in America is generally less than that of the other class. The cost of maintenance and repairs over openings to pipes is less in the lake asphalt class of pavements, especially when the surface heating machines are used for general repairs. Both classes of pavements are standard, and are generally permitted to compete with one another. The specifications, however, must be carefully and fully prepared by reliable and experienced men, to secure good materials and workmanship.

The total miles of brick pavements reported to date, including all American cities, amounts to about 750. It is found principally in Western cities, including many small towns. A tabulated statement covering quantities, cost, kinds, etc., of asphalt, brick, granite, etc., is found on page 18 of the January, 1898, issue of this magazine.

LOW PRICES AND BAD WORK.

The prices bid for asphalt pavement in Newark, where I live, are lower than ever before. The work is done so rapidly that it does not seem as if we were getting as good pavements as those first laid in our city. They seem to be thinner and laid with less care and precision. How can good work be secured, when the paving companies are likely to lose money?
Tax-payer, Newark, N. J.

The city specifications, if conformed to, will probably secure good

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for their positions. When a large amount of work is being done at one time, the city engineer can not give it his personal attention. Newark needs a consolidated, centralized, well-equipped engineering department, with additional permanent employes, independent of political parties. New Jersey cities, as those of several other States, need civil service in connection with their water-works, sewers, pavements and other public works, especially as far as the engineers and minor employes are concerned. The chiefs are generally retained, but many subordinates are not.

As to companies losing money, that is their affair, although it is not good policy for cities to award contracts at prices below cost, unless the city will compel good work and be ready to pursue bondsmen in case of default on contracts which so often follows when large amounts of work are taken at too low contracts.

LOW PRICES OF ASPHALT PAVEMENTS IN 1898.

Please let me know what you consider to be the principal causes of the great variations in the price per square yard of asphalt pavement during last year and the prevailing low prices this year. I am a member of a paving committee and do not know what price to recommend as a basis for estimates for asphalt paving which we desire. *X., Detroit, Mich.*

Inquiries made among the paving companies elicit several partial answers. The principal reason for the fluctuation in price was the desire to secure business, even at a slight loss, during 1897, rather than incur the greater loss which results from having large plants lying idle and paying certain men which must necessarily be constantly employed. Slight improvements in the methods of mixing and laying have reduced the cost a little, especially that of maintenance which, due to the surface-heating or repair machine, needs no longer add much to the first cost and be included in it. The "hard times" of the past few years have reduced the cost of labor and materials very much. When we remember that about 95 per cent. of materials entering into an asphalt pavement, including foundation, are crushed stone, cement, sand and powdered limestone, or its equivalent, we see that the cost of such a pavement is much reduced when the prices of these materials are reduced. The prices of asphalt and residuum oil or other flux do not so much govern the cost of the pavement as that of other materials and labor. The almost universally low prices of pavements of 1898 is due primarily to bitter competition and, as one company states, "to stay in the business temporarily until better times arrive, for many pavements are being laid at less than cost in many cities as a result of several companies bidding against one another at ruinous prices." A slight rise in cost must soon take place. It would be wise to use as a basis for your estimates, not the present cost, but an average cost in your city for as many years as possible. Cost is a local question.

GRANITE BLOCK PAVEMENT ON STEEP HILLS.

How can granite or other cut stone blocks be held in place on a paved street where the hill is very steep? Heavy showers wash out the blocks after a few months. *A. L. Dodd, Newburg, N. Y.*

The blocks should be laid as closely together as possible. The crown of the street on very steep grades should be sufficient to force the water to the sides. Hydraulic cement mortar composed of one part of cement and two of sand or bituminous cement should be used to fill the joints between the blocks next to the curb and for a width of about

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three feet along each side of the street. The water would thus be turned to the gutters and the rush there would not wash out the paving blocks. This is done throughout Europe, and in many cities in this country. Stone block pavements when thus laid, even without a concrete foundation, give lasting results on steep grades.

LIMITING PRICE OF PAVEMENTS.

We desire to have a first-class, durable, asphalt pavement in our city, but fear that if the specifications are drawn so as to secure such a pavement, advantage will be taken of the kind of asphalt we desire and an increase in price demanded. Would it be wise and legal to limit the price in some way? *Mayor of ———, N. J.*

In addition to having specifications which admit successful asphalts to competition, the price can be limited by inserting in the ordinance and specifications words to the effect that "any bids exceeding (here insert the maximum price the city is willing to pay) will be irregular and informal, and not be considered."

There is no legal or legitimate objection to this method of limiting the cost. The city engineer alone, or with the assistance of an expert, temporarily employed, could recommend the maximum price to be allowed. It would vary in different cities, because the price of materials, labor, freight, etc., are seldom the same. The above does not apply to asphalt alone, but to all pavements.

BY WAY OF COMMENT.

Uniform Cement Standards. Until quite recently the practice by various authorities in testing cement has been so varied that there was little uniformity in requirements. This was justified by the lack of definite knowledge of cements, particularly of American cements, by the local requirements, and by the better knowledge of the behavior of local cements or of favorite brands of imported cements. The vast improvements in the manufacture of American cements, and the increase in knowledge of their action has had a tendency to a uniformity of requirements, so far at least as Portland cements are concerned. The products of natural cement mills in various districts are not of sufficiently similar quality to make uniform specifications possible for them. Specific examples of this tendency toward uniformity of requirements, in specifications for Portland cement, are numerous. Thus in 1896 there were about as many varieties of specifications in use in the United States Engineering Department as there were officers in charge of work, and variations in quality were considerable. Tensile strength of neat cement required after one day in air varied from 70 to 300 pounds, after six more days in water, from 300 to 500 pounds, after a month, from 400 to 700 pounds, and so on. The mere compilation of the table showing differences has produced greater uniformity, and the personal differences are now disappearing, leaving only those demanded by the difference in character of the work.

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Similar approach toward uniformity is noted in other classes of work. Much of this is doubtless due to the efforts of manufacturers and their agents, as practical uniformity for similar circumstances is essential to the economical production of material, and to satisfactory results therefrom. Mr. R. W. Lesley has collected the statements of many specifications in a paper giving "A Summary of Recent Cement Specifications." The tendency toward uniformity is shown in the averages for various classes of work. Thus the averages of the United States government specifications, of European government specifications and of 91 other miscellaneous American specifications show variations from 134 to 144 pounds after one day, 347 to 394 after seven days, and 528 to 536 pounds after twenty-eight days, a most remarkable agreement. When the results are divided into smaller classes, however, the concordance is not so pronounced, but the differences are susceptible of explanation. Thus in the table giving averages of United States engineers, nine cities, six railways, six bridges, three aqueducts, the lowest requirement for fineness is made by the railways, followed in order by the aqueducts, the United States engineers, the bridges and the cities. For tensile strength of mortar the order is very nearly the same, also for ten-

highest figure. The average character of the work in each of these divisions may reasonably be considered responsible for the order in which they occur in the list. Most city work is less massive than that in the other classes given, and a material increase in requirements might reasonably be expected here. Only in such work as concrete arches or walls where appearance and durability under severe conditions are required would demand higher standards.

Cities show a tendency to increase their requirements more rapidly, perhaps, than other classes. Thus Philadelphia now requires a material increase in tensile strength over the specification in use in 1896. From 450 to 500 pounds tensile strength per square inch neat, after seven days from 550 to 600 neat, after twenty-eight days, with proportionate increase in strength of mortar. One marked tendency of city specifications is towards a high requirement after one day, the average being 161 pounds, while the United States government engineers require 131 pounds, and the railways but 115 pounds. This probably arises from the fact that city work is so frequently hurried in its time of completion and use, and must therefore attain its strength at the earliest possible moment. This tendency towards rapid increase in strength may be

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in strength, and even produce diminution in strength, and disintegration of the mortar in the structure.

Even the averages in the case of natural cement show great variations in requirements. Individual specifications, which are intelligently prepared, show to the well informed engineer, by their requirements, the character of the local hydraulic cement.

Baltimore Sewerage. The city of Baltimore has attained a population of more than a half million, and is still without a sewerage system. A large number of drains for carrying off surface-water have been designed and constructed with varying degrees of skill, which, with a few exceptions, are adequate for this purpose. Some house drainage is provided for by private drains, and much of the central portion of the city is drained into the surface-water sewers, although permission for such connections has always been given under protest, expressed or implied. The city and county drain their public buildings also in this surreptitious way. Most of the house sewage must, however, be removed by wagon. The methods of removal are far from satisfactory though, at least theoretically, under control of the board of health.

It seems hardly possible that a large and wealthy city in this country and age could be in the condition of Baltimore, whether from dread of the expense or from an almost inconceivable condition of lethargy. All sorts of temporary and impractical schemes are proposed to postpone the evil day when the work must be actually begun. The city is at the head of the Patapsco river, ten or twelve miles from Chesapeake bay, the tide rises but a few inches, and there is a little fresh water running into the river, all the streams being polluted also by sewage from the city. Consequently the refuse deposited in the basin or harbor settles or floats on the surface, remaining until decomposition produces nuisances which are unbearable to visitors and are becoming so to the population immediately surrounding. Dredging is proposed, with no thought of the endless repetition of the operation which will be necessary. A harbor commissioner soberly proposes to sprinkle the harbor with lime in sufficient quantities and with sufficient frequency to disinfect the water! A tunnel to add a supply of fresh water is proposed by the mayor, with no hint as to whether the amount available is sufficient to produce any effect. He proposes also to send the sewerage commissioner to Europe to find out the best thing there and bring it home.

All this seems very much out of place in a city of this size. We have come to expect every city offi-

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to any official position, but the problems in a large city are so overwhelming to the layman and the average understanding of this fact is so complete among those influential in affairs in large cities that the Baltimore methods cause surprise. This surprise is increased when it is known that the city has already had three reports by sewerage commissions which have been remarkably concordant in their recommendations when the differences in time are considered. The first commission was appointed in 1859 and reported in 1862. The second commission consisted of a single engineer, Mr. C. H. Latrobe, appointed in 1881.

The third commission, with a past president of the American Society at its head, Mendes Cohen, was appointed in 1893, and made its report last year, having the constant assistance of Kenneth Allen as principal assistant engineer, and the assistance and advice (in which both concur), of Messrs. S. M. Gray and Rudolph Hering, and the further advantage of consultation with Col. Wm. P. Craighill, of the United States corps of engineers, who is fully conversant with all the local conditions affecting the discharge and disposition of sewage. Their elaborate report of 232 pages, with many maps and drawings, covers the ground completely and their recommedations are strongly put and well fortified by argument and array of facts.

The only difficulty seems to be that an adequate system of sewers to dispose of the entire house sewage of the city will cost somewhat more than $10,000,000, with an annual expense for maintenance of a little more than one-third of a million. The expense for construction would necessarily be spread over ten years or more, and the cost of maintenance would increase from zero as the construction proceeded and connections were made. This seems like a small figure for the sewerage of so large a city but the conservative tax-payer sees it all at once, and will not distribute it through the coming years as the requirements of actual construction demand. Neither does he see the long years of saving when the expense of carting away his most offensive refuse is cut off by the new method of water carriage. There is no doubt it will cost more money to construct the sewers now than if they had been properly constructed at the proper time, and also no doubt that he has lost money in the past on account of excessive annual expenditures for removal of sewage, but the future saving will soon repay the extra present expenditure. Longer waiting will only increase the cost of construction and add to the sum needlessly spent each year on wasteful methods of removal. Smaller cities can see here the great disadvantages of undue postponement of this class of improvements.

Errors in Bids. The question of the rights of bidders on public work in case errors have been made in making bids or filling

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blanks has received considerable light from the decision of the case of Moffett, Hodgkins & Clarke Company against the City of Rochester, in the United States circuit court for the northern district of New York. When the bids were opened and during the reading the representative of the company announced the fact that two errors had been made in writing out the bid and claimed the right to withdraw his bid. The refusal of the city to recognize this right led to the suit. The company was able to prove that the errors claimed were actually made and to show that they made a difference of about $64,000 in the cost of the work. The court decided, after a lengthy argument, that the careless bidder had a right to withdraw his bid.

The question now arising is, where shall the line between clerical error and error in judgment be drawn. Also, it would be easy for a low bidder by collusion with one or more other bidders to practice a fraud on the city and thus frequently secure the work for one of the members of the combination at a higher figure than the lowest bid, by timely claims of error. If the board of works assumes the decision of the question whether an error has been made, there is, again, chance for favoritism, and at least insufficient authority to procure information upon the subject. Therefore, notwithstanding the establishment of the principle on which the decision should be based, it will be safest for the board to leave the decision of the questions of fact and of the principle involved in the particular case to the courts, denying the right to withdraw the bid until the court has decided it to be erroneous.

Asphalt and Street Rails. The conclusions drawn from very general observation by several experts seem to be that with the usual methods of laying street railway tracks, without special foundation under the ties, the repair of the asphalt next the rail is excessive if the rail is but six inches, or less, in depth. If it is eight inches or more in depth, the amount of vibration is so much reduced that the repair along the rails is reduced to a reasonable figure. If a concrete foundation is placed under the ties, there is scarcely more repair along the rail than along any other boundary line between asphalt and other material. The unsightly brick or stone toothing is also found to be unsatisfactory. When poor foundations or light rails require brick or stone along the rails to take the vibration, straight lines between asphalt and brick or stone give much better satisfaction. Some of the new repairs in Detroit are excellent illustrations of these facts.

Better Technical Education. Under the title "A Higher Industrial and Commercial Education," Professor Johnson, in his presidential address before the Society for the Promotion of Engineering Education, makes a

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plea for schools similar to the German mono-technic schools, which are trade schools, and more because they have a basis in the fundamental studies which all engineering courses should have, and then put about three years into the special training for the trade or branch of the engineering profession which is chosen by the student. He attributes the rapid advance of the German nation in manufactures and in commerce to these technical or trade schools, and to the schools of commerce which do a similar service for students choosing commercial pursuits for their life work. He also describes, without distinguishing them from mono-technic schools, what are actually trade schools, not requiring the same basis of education.

Professor Johnson says we have no such schools, and that we must have them if we wish to retain our prestige in manufacturing and gain any in commerce.

The two kinds of schools (which shade into each other by almost imperceptible gradations) have quite different purposes and produce quite different results upon the students. The trade schools, requiring for entrance little more than the most rudimentary education, produce better artisans and men who, if endowed with natural abil-

apprentice system in every respect but one, that of experience, and they put the artisan into such condition of training that he can improve his standing more rapidly in this regard, and with better appreciation of the reasons for the facts which he observes.

The mono-technic schools do much more than this. In their highest and best form they demand a fair approach to a liberal education as a condition of entrance, a standard equal to that attained at the end of two years in an American technical school. With this basis they are able to give their students in their course of three years a training in all the details of this chosen branch of trade or manufacture, and at the same time to give them the scientific basis for the processes involved, and show the development of the art or science involved and the probable lines of future improvement. Graduates of such schools are able, after a reasonable amount of practical experience, to take charge of manufacturing or trade enterprises, to manage them successfully and to advance the knowledge of principles and processes.

The technical instruction in the two kinds of schools is not far different in ground covered or even

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Professor Johnson does not develop this difference with sufficient care, and one who reads his paper is liable to say that he considers this technical instruction responsible for the great advance in the ability of Germans to manage enterprises requiring technical skill and the consequent marvelous progress of the nations in trade and manufactures. He would probably reply that this ability is the result of the excellent training of the powers of the mind which is obtained first in the preparatory course of study for the mono-technical school, followed by that in the school itself, and that the application to the specific branch of manufacture was due to the specific instruction in a particular school, and that the instruction in the trade school made better artisans but did not necessarily produce capable superintendents and managers.

We agree with Professor Johnson that these classes of schools are of great value to the nation. We need both kinds. We are making some progress in trade schools, but thus far have made little progress in the higher grade described. The warning which must be heeded by Americans in establishing schools similar to the mono-technic schools, is that a formation must be laid in a good general education with scientific tendencies. The place for the higher grade school desired is not at the natural break in our system, after the high school course, but is after two or three years of college or engineering school training. The tendency in this country will be towards dropping out these two or three years, which are required in the German schools. The results of such action would be to diminish the power of the graduate by this amount, and to handicap him in the race with those having the better equipment, causing him to take lower positions until by several years of study and experience under somewhat adverse circumstances he can recover the lost ground; or if this competition is lacking, he will find his product must meet the products of other better prepared establishments and he must stand the loss of trade and lowering of price until he can gain the lacking power through the education given by experience, observation, and individual experiment.

The same reasoning applies to the proposed schools of commerce. We need schools that will teach commercial methods, geography, and law, the history of commerce, the details of commercial products, languages, the technical details required in many lines of trade. If, however, the ordinary school-boy is put into this course of study of two or three years, he will become a good clerk in such business, but, except by unusual natural ability, or through lack of trained competitors, he will not attain to positions of management or control. A strong preliminary training, like that demanded for the mono-technic

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school, will give him a great advantage in the race of supremacy.

Municipal Ownership.

The earnestly interested municipal officials who attended the recent meeting of the League of American Municipalities in Detroit showed more spirit in discussing municipal ownership than any other question affecting cities. One of the planks in the platform of the league has been municipal ownership of public utilities, and its first president was most outspoken in his advocacy of the principle. Without inquiring as to the ulterior motive for pushing the question to the front in this organization, a valuable service has been done by this action. Some valuable points were emphasized at the recent meeting in Detroit.

The independence in theory of this question and that of good municipal government was recognized, but the necessity of a merit system to secure results in management and operation comparable with those secured by private corporations is not less obvious.

There was no serious discussion of the fundamental principles upon which the theory of municipal ownership rests, nor of the logical steps to be taken in this direction. Neither was there much discussion of the principles upon which good city government is based, nor of the demand. While these two lines of discussion are independent, they are parallel, and satisfactory results in all respects from municipal ownership can not be attained unless material improvements are made in municipal methods of management so far as these departments are concerned.

As developed in a short leading article in the January number, and in several articles in this department from time to time, there is a pronounced tendency towards municipal ownership, beginning with the construction of sewers and continuing through the construction and repair of streets, the supply of water and electric light, with a few instances of supply of gas and heat, ownership and management of street railroads, telephones, telegraph and others. The underlying principle seems to be that such public utilities as are natural monopolies should ultimately be owned by the municipality. The rapidity with which this ownership shall be assumed, and the order in which the various monopolies shall be absorbed by the city seem to be fixed by the rate of progress in the cause of good government, and by the universality of the need of them. Thus there is now little question of the municipal control of the construction and repair of streets in cities large enough to demand any sort of pavements, nor is there objection in many places to

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of the line, as the difficulties of procuring and protecting supplies by private corporations increase.

Similarly municipal lighting is frequently undertaken, but the furnishing of light to private consumers is not fully recognized as a true natural monopoly. The operation of street-car lines, telephones and other similar monopolies, is still further removed from general municipal necessities, as they serve more directly the individual citizen. Good government must take some large strides forward before municipal ownership of the latter class will have much vogue.

Glasgow is going so far that she is losing sight of the principle on which municipal ownership is based in most minds, and is taking charge of amusements, dwelling houses for working men and other charities; and fields where there is no hint of monopoly, natural or artificial. The time for reaction and return has arrived there.

A Very Bad Example.

People are often judged by their associations. If this rule is applied to the municipal officials responsible for membership in the organization which calls itself the League of American Municipalities, the position in which they now find themselves must be very distasteful. In no municipality would the people knowingly tolerate in their local officials the questionable abuses and irregularities which have become chargeable to this League during its existence of less than a year. If responsibility for its character and record should be admitted by them it would be equivalent to confessing that they are willing to countenance official irregularities in financial matters. If this confession should be made directly to the people who put them in charge of municipal affairs it would certainly result in loss of confidence in them by their constituents and loss of position. The public is confronted with the astounding fact, however, that an organization assuming to represent American municipalities is discredited by having made for itself a record of this kind.

There is nothing to be said but that the organization is irresponsible or is destitute of due regard for common standards of propriety. Municipalities having no sympathy with this sort of thing may regard it as an insult to be asked to join in and become parties to its schemes and its conduct. It is due to most of those who have been drawn into connection with it to say that the unfortunate record of the League has been made for it by only twenty-seven out of seventy-two municipalities which were induced during the year to join it, and there is good foundation for the belief that the municipalities which have had no responsible part in the discreditable conduct of the League, except their nominal connection with it, will clear themselves when the time comes for them to be heard from. An organization that assumes to represent American municipalities should be itself a good example of

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proper conduct of affairs, and should be managed by men of high character, with reputation for ability, thorough experience and knowledge in connection with municipal government.

It is understood that the newly elected president of the League of American Municipalities, Mayor Black, of Columbus, Ohio, is deeply chagrined over the embarrassments of the organization, and that he hopes to be able to relieve it from its predicament. Certainly the sooner the task is accomplished the better it will be for the organization.

City Officials' Societies.

Enginering News has a long editorial in a recent number regarding the organization of so many national societies concerned with municipal affairs, and very properly questioning the duplication of effort which occurs. There are two great divisions to which such societies can be assigned. One has to do with the questions of municipal government. There are numerous good government clubs, and municipal reform associations, with the National Municipal League as a central organization, whose purpose is conference upon methods, and education of tax-payers and officials. The other has to do with the problems of public works of national or sectional, form a group.

Such an association as the English Association of Municipal Engineers and Surveyors would be another legitimate member of the class. The Public Health Associations have some connection. Then there are the associations of municipal officials who are engaged in public works. These associations, if successful, must have as their main dependence the work of the experts in the various lines of municipal work, the engineers, sanitary, bridge, electrical, mechanical, the health officers, and other technical men, with the assistance of all municipal officials who have influence in the constructive or sanitary departments. The American Society of Municipal Improvements is a society established upon this basis and it has now had several years of successful experience and has done much valuable work. The great value of such a society is the interchange of experience and the spread of knowledge. This value depends directly upon the technical ability and practical experience of the members imparting their knowledge; hence the necessity of the presence of men of high standing in the constructive professions among the members. This is a notable characteristic of the society mentioned.

Our contemporary questions the

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formed. A careful study of the proceedings of the recent convention at Detroit and a reading of the papers show that the league does not seriously attack any question of municipal affairs, unless, possibly, that of municipal ownership of public utilities, and this is considered more in the manner of the politician making points for a campaign than with any serious scientific study of the details of the question. Our contemporary feels that the league is a rival of the American Society of Municipal Improvements, and that it is perhaps intentionally so. We can not see that this is true in any but the most superficial sense. Few serious students of municipal problems are long satisfied with the inadequate treatment of subjects by the league, and when the more thorough methods of the A. S. M. I. are recogized are ready to transfer their membership. Those who become members for any less laudable purpose are not desirable members for any society, and if largely predominant in it, will soon lead it to its destruction.

The flavor of personal interest in the League is too strong to make the organization acceptable to thinking men. The methods of the two societies need but slight inspection to determine which is the more valuable, and to show the slight grounds there are for a statement that they are rivals in any true sense.

LEGAL DECISIONS.

[Reported specially for MUNICIPAL ENGINEERING.]

Steam Rollers Not a Street Obstruction—A steam roller, while being properly used in repairing a street, is not such an obstruction or defect in the street as will render the city liable for injuries inflicted by a horse frightened by such machine. Lane vs. City of Lewiston (Me.), 39 Atlantic Rep. 999.

Electric Light Plant Not Public Necessity—Under the laws of North Carolina prohibiting municipalities from contracting debts or laying taxes, except for necessary expenses, unless by a majority vote of the qualified voters, such city having general powers only, cannot issue bonds for the erection of an electric light plant for lighttion authorizing the same for the length of time required by the statute, such defects are not cured by recitals on the bonds, nor by a certificate of the state auditors that they have been regularly and legally issued. Springfield Safe Deposit & T. Co. vs. City of Attica, 85 Federal Rep.

Enjoining City From Carrying On Business—While a person carrying on a similar business cannot on the ground that the same has been injured or destroyed by competition on the part of the city, enjoin it from engaging in a business which is ultra vires beyond its charter power, he may do so as a citizen and tax-payer. Keen vs.

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provements—When a city accepts work on a street under a contract, and by its own action discontinues further work thereunder, it is liable for the breach, although it has thus disabled itself from collecting assessments on the property benefited to pay for the work. City of Dunkirk vs. Wallace (Ind.), 49 Northeastern Rep. 463.

When Objections to Improvements Are Too Late—After street improvements are completed a land-owner cannot object to assessments for same on the ground that the contract was let to one whose bid was slightly more than that of another, although the law requires the contract to be let to the "best bidder." City of Bloomington vs. Phelps (Ind.), 49 Northeastern Rep. 581.

Contractor Bound By Certificate—Under a contract providing for compensation at a fixed price per square yard of earth moved, the amount due to be certified by the general manager of the railroad month by month, such certificate is conclusive, in the absence of fraud, mistake or gross carelessness, so as to prevent the contractor after completing the work from asserting a claim for extra compensation or alleged overhauls. Breyman vs. Ann Arbor R. Co. (U. S. Cir. Ct.), 85 Federal Rep. 579.

Streets, Grades and Railroads—Where a street railway company, for its own pecuniary advantage, lays its tracks on streets whose grade has been established by ordinance, but which the city is not prepared to grade, and perhaps will never have occasion to construct, the railway company is liable for damages occasioned by such work to abutting property. Bancroft vs. City of San Diego (Cal.), 52 Pacific Rep. 712.

Parties Bound By Estimate of Engineer—Where parties agree that payments for work and materials shall be made upon estimates of a certain engineer, to recover more a party must allege and prove fraud or mistake on the part of such engineer in making estimates. Thompson vs. Bradbury (Idaho), 51 Pacific Rep. 758.

Paving Contracts In Iowa—A city has no right to make a paving contract where it failed to publish notice as required by the laws of the state showing the "extent of the work, * * * when the work shall be done, and at what time the proposals shall be acted upon." Polk vs. McCartney (Iowa), 73 N. W. 1067.

No Damages Where City Completes Different Sewer—A city cannot recover damages for failure to complete a tunnel in accordance with contract which provides that, in case of default on the part of contractors, the city should complete the work at their expense, when the tunnel as constructed by the city is essentially different in plan and construction and cost from that for which it had contracted. Milwaukee vs. Shaller (U. S. Cir. Ct. App.), 84 Federal Rep. 106.

CURRENT INFORMATION.

Irregularities in the League of American Municipalities.

The League of American Municipalities, the organization which was started a year ago under circumstances which brought it under suspicion as a movement which the promoters were manipulating for private gain, put itself before the public at its Detroit meeting in a still more questionable attitude. Not only did it fail to correct abuses in the management, but it discredited itself and showed a degree of irresponsibility which could hardly be expected from any body of intelligent men.

The League assumes to represent American municipalities or such of them as have been drawn into connection with the or- this were true, the evil would not assume the proportions of a national calamity, for the total number of cities and towns represented at the meeting by membership in the organization was fifty-two. About twenty others reported as having joined the League were not represented. As a matter of fact the membership is a doubtful quantity. There was no roll-call until it was demanded on the third day of the meeting, no committee on credentials was appointed at any time, and there was no verification of membership in any of the ways usually followed by deliberative bodies. A little loose procedure of this kind, however, was of small moment in comparison with other irregularities. The secretary, B. F. Gilkison of

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in good business form, showing that he had received $590, how it had been disbursed, with vouchers therefor, together with his bank account as treasurer. He refused to assume any responsibility in connection with the money that had never been turned over to him by the secretary, but, accompanying his report, submitted a letter from Gilkison offering to give him a check for $750 if he in turn would hand Gilkison a check for the same amount at the same time for salary. He had declined to be a party to this proposed transaction. The treasurer also submitted as exhibits bills and letters from creditors of the League in New York complaining because they were unable to collect the money due them. The two reports showed that while $2,280 had been collected from cities belonging to the League, the secretary had not turned over to the treasurer any of the funds after the first three months; that out of the $2,280 there was only $3.55 left on hand, and that there were bills that had not been paid. The provisions in the constitution for the handling of the funds had been almost wholly ignored. The treasurer had called the attention of the president, John MacVicar of Des Moines, to the irregularities of the secretary, but his efforts to obtain a proper accounting had been in vain. Why the president failed to require a proper handling of the funds, when it was his duty to do so, as well as to approve all bills before money could be disbursed, were matters that he did not see fit to explain to the League.

On motion of Mayor Gibson of Zanesville, O., an auditing committee was appointed. This committee consisted of Mayor Gibson, Mayor Johnson of Fargo, N. D., and F. A. Walker of Trenton, N. J. The committee had been assured that it would find everything all right, but when it called for vouchers and receipts as evidence of the secretary's expenditures, they were not forthcoming. The committee reported that it could not excuse this as a technical error, as claimed by the secretary, and that the secretary's conduct should not be passed lightly. The secretary's friends attempted to defend him by claiming that in working up the movement a year ago he had advanced money for expenses and had reimbursed himself in this way. It was shown, however, that this was not in accordance with the facts, for during the first three months money had been turned over to the treasurer in accordance with the requirements, and it was since the first of the year that the secretary had failed to turn over the money that came into his hands. In the face of the disclosures the League was compelled to adopt the report of the auditing committee censuring the secretary, but, after doing this, how it could excuse its action in subsequently re-electing as secretary the man who had been guilty of these irregularities is inexplicable. This, however, was what was done by the League of American Municipalities. As an example to American cities of business management and straightforward methods it is not calculated to inspire confidence. It is a very substantial kind of encouragement of irregularities in financial methods. After the disclosures Gilkison announced that he would not be a candidate for re-election, and it was proposed that John MacVicar, the president, should be nominated for the office. MacVican expressed his willingness to accept the position, stating that he had sold out his business and would be able to give time to the League. There was criticism of him on account of his willingness to step from the presidency to the secretaryship, and because he as president had permitted the irregularities of the secretary to continue after the treasurer had called attention to the matter. MacVicar's name was not presented to the convention, however, when the election occurred. An appeal to sympathy was made in Gilkison's behalf, and he received 27 of the 41 votes cast.

There appeared to be little earnest interest in the meeting by the majority of those in attendance. The attention of the delegates was given chiefly to the entertainment features provided for their pleasure by the city of Detroit, and it was evident that most of those who were there went for this enjoyment. It was evidently not expected that there would be much serious interest in the meetings. The program was remarkable for its failures. It provided for general discussions to be led by certain persons, most of whom failed to appear, or send substitutes or excuses. Interesting contributions were made by two or three college professors who were not on the program, an able address was delivered by Mayor Jones of Toledo on municipal ownership, and from a few good speakers and earnestly interested delegates who had gone to the meeting hoping to learn something, the convention derived whatever of serious character was shown in its proceedings. An outline of this phase of the meeting is given below.

In his address at the opening session President MacVicar urged more serious consideration of the problems of municipal life, and favored municipal ownership of public utilities and the merit system in municipal service. With these two reforms

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he thought "there would be less to prevent the peaceful evolution of good government in municipalities."

Governor Pingree, in an address, expressed the opinion that the vital question in municipal reform is how to compel so-called good citizens to take an active part in city affairs in some other capacity than fault-finders. He believed in getting knowledge from other cities, and told how he had taken the officials of Detroit on a junket at a cost of $5,000 for the purpose of learning from other cities.

In a paper on "Garbage Disposal" F. A. Walker of Trenton, N. J., referred to the systems of destruction and reduction, and favored the former, which is in use in Trenton. The garbage is collected at an expense of $6,000 per year and is destroyed in a Dixon crematory which has been in use over two years with little cost for repairs. It is operated at an expense of 30 cents per ton for the material cremated.

C. A. Collier, mayor of Atlanta, said that the same system was operated in his city and the expense of the sanitary department is $140,000 per year. Mayor Maybury spoke of Detroit's contract at $50,000 a year for three years for collecting garbage and carrying it on cars to a reduction plant 20 miles from the city. He favored collection of garbage by the city instead of having the work done under contract.

James A. Lavery, president of the Labor Federation of New York, spoke on "The Relation of Municipalities to Organized Labor."

In a discussion on administration by boards, single-headed commissions or council committees, Mayor Young of Akron, O., favored placing one man at the head of each department, and Mayor Evans of Birmingham, Ala., thought that council committees should have charge.

Prof. Frank Parsons delivered an address on "Municipal Liberty, or Local Self-Government." The scheme of government which he advocated included municipal ownership of public utilities, the initiative and referendum and woman suffrage.

In the discussion on the regulation of saloons there was strong opposition to severe restrictive laws affecting saloons. It was urged that efforts to raise the standard of the saloon business, instead of degrade it, would have good results.

and spoke of the advantages derived by the people of his city from municipal ownership. The average rate for families is about $5 a year and it is expected that this will be reduced to $4 in about three years. The city appropriation for the water department is $50,000 a year. The experience in the water department of Syracuse had been favorable to the day labor system for public work. George Hillyer, president of the water board of Atlanta, described the Atlanta water works. He advocated the use of reservoirs of 20 to 40 days' capacity and favored the use of meters. This system had enabled the Atlanta works to largely reduce their fuel expenses and pumpage. He favored also mechanical filtration.

The discussion on municipal ownership, on the fourth day of the session, was the most spirited of the meeting. It was led by Mayor Jones of Toledo, who favored municipal ownership. Mr. Greene, who spoke as a former mayor of Binghampton, N. Y., thought that information should be sought on both sides of the question and favored writing corporations to send representatives to join in the discussion. He offered a resolution requiring a uniform system of accounting for municipal electric light plants to be erected by the state which was adopted.

The election of officers resulted as follows: President, Samuel L. Black, mayor of Columbus, O.; vice-president, W. C. Maybury, mayor of Detroit; treasurer, T. P. Taylor, mayor of Bridgeport, Conn.; secretary, B. F. Gilkison, New York City. Mayor Taggart, of Indianapolis, over his protest, was unanimously elected treasurer. After his positive declination, Mr. Taylor was elected. It was decided to hold the next meeting at Syracuse, N. Y.

The entertainment provided by the city of Detroit included a reception by the mayor, an excursion by boat to St. Clair Flats, a band concert and illumination at Belle Isle Park and a trip to Water Works Park.

Arrangements had been made for exhibits by manufacturers, but there were few, including the Welsbach Light company, the Atlas Cement company, the Dixon Garbage Crematory company, the United States Voting Machine company and Seagrave & Co.

An injunction against the expenditure of public funds in providing the entertainment

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longed to a fund that could not be diverted for entertainment purposes.

A Consul's Report on Pavements in Berlin.

The State Department at Washington is in receipt of a report from Consul-General Goldschmidt of Berlin, in which he gives facts regarding the pavements in Berlin. The area of carriage pavements is 6,500,405 square yards. Of this area a fraction less than 74 per cent. has stone pavement, about 25 per cent. asphalt, and a fraction over 1 per cent wood pavement. The proportion of asphalt is steadily increasing. The soil, continues Mr. Goldschmidt, consists of coarse, gritty sand, forming apparently an excellent foundation for the heavy 8-inch layer of gravel and cement, over which the 2-inch covering of asphalt is spread, making a strong and durable pavement. The average price of asphalt pavement in Berlin is $2.80 per square yard. The city government grants the contracts for laying the pavements, and also for keeping them in repair for twenty years, the first five years without extra compensation, and after that for an annual compensation of 10 cents per yard.

A Municipality Enjoined from Constructing Water Works.

The Supreme Court, in Philadelphia, handed down a decision recently which is of much importance to boroughs building water works. After the decision in the case of Metzger against the borough of Beaver Falls, Pa., in which the borough was enjoined from constructing its own works because it had exhausted its municipal power to build works by an existing contract with the Union Water company, the People's Water company was formed by citizens to give the borough a supply. The council passed an ordinance for a contract for ten years, from January, 1898, at $4,000 annually. Under the contract the borough was given the right to purchase the plant at any time after its completion. In behalf of the old contract with the Union Water company Titus M. Welsh asked the courts to stop this move. The lower courts enjoined councils from adopting that part of the contract providing for the purchase of the plant, but declined to interfere otherwise. Justice Dean of the Supreme Court finds that the proposed contract is a palpable attempt to evade the decree of the Supreme Court in the Metzger case, and while it refrains from giving an opinion as to the borough's right to allow a second company to lay pipes in alleys and streets, it holds that the borough must not indirectly and evasively do that which by a former decree it was prohibited from doing directly; that the borough has exhausted its right to contract with water companies for municipal purposes when it made the contract with the Union Water company. The decree of the lower court is reversed, and it is ordered that an injunction issue preventing the borough council from passing the ordinance and from entering into any contract with the People's company for supply of water for municipal or fire or other purposes.

Annual Meeting of the American Society of Municipal Improvement.

The fifth annual convention of the American Society of Municipal Improvements will be held at Washington, D. C., Oct. 26, 27 and 28, the time having been advanced two weeks for the convenience of many members who wish to attend the conclave of the Knights Templar to be held in Pittsburg during the week corresponding to the regular date. President Van Duyne accordingly took the responsibility of changing the time on the unanimous request of the executive committee. The president has also sent letters to the chairmen of the several standing committees urging them to make the coming meeting the most instructive and helpful to members of the society that has yet been held. He has suggested that in preparing reports the important conclusions reached by committees should be sent to different members of the society interested in the subject, with the request that they each prepare a paper requiring not over fifteen minutes in reading discussing the particular point or conclusion reached. It is expected that this plan will result in having more members take part in the discussions, and the experiences of many cities will be more clearly brought before the convention. The letters received by President Van Duyne from chairmen of committees indicate that the work of preparation for the convention is progressing well and that "the Washington meeting," as he says, "will be a very instructive one to all."

The American Society of Municipal Improvements is composed of officials—mayors, councilmen, boards of public works, city engineers, commissioners and superintendents—representing the leading cities throughout the country. The fee for membership is nominal, being only $5 for each municipality, which entitles it to as many representatives as it may wish to send to the meeting. It has no high-salaried officers. It dis-

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cusses the practical questions affecting municipalities and much valuable information has been brought out at its meetings.

Decision on the Method of Assessments for Improvements.

In an opinion submitted by Judge Archibald Aug. 15 the assessment for the Mulberry-st. paving in Scranton, Pa., is declared invalid, and a total change in the cost to each of the property-owners who were called upon to pay for it becomes necessary. When the assessment was prepared by City Engineer Phillips, he was guided by the foot-front rule, by which procedure the expense to each one was determined by figuring the whole cost of the pavement, including street intersections, and dividing it by the total frontage of the properties abutting on both sides of the street. The court decided that if this were followed to its logical conclusion, properties on the portion of a street wholly occupied by street railway tracks might be made to pay as much as those where the street was entirely clear of them.

The Company Could Not Be Compelled to Furnish Water.

In the mandamus suit of W. H. Stackhouse vs. the Pocatello Water Works company, at Pocatello, Idaho, Judge Standrod decided in favor of the water company Aug. 8. The grounds on which the suit was instituted were that the water company shut off the plaintiff's water on the ground that he had violated certain regulations of the company in regard to sprinkling and irrigation. The plaintiff demanded of the company that the water be turned on again. The plaintiff refused, however, the payment of 50 cents as the cost of turning off the water, and a promise to observe the rules of the company in the future. He asked the district court for a mandamus directing the company to turn on the water or show cause why they did not do so. The court holds that the facts set out in the answer, that of violating the rules and refusing to comply with certain other rules, furnished sufficient cause for the water company's action.

Legal Opening of Bids.

advertised for the bid. The decision was rendered in an application for a peremptory writ of mandamus made by Wm. J. Rodgers to compel Controller Coler and Commissioner of Highways Keating to accept his sureties on a contract for improving Woodlawn road. Louis N. Haffen, the commissioner of street openings and improvements, was attending a meeting at the mayor's office the day the bids were opened, which was Dec. 31, 1897, and the bids were opened by his secretary. The new charter came into existence the next day, and Contractor Rodgers, who was the lowest bidder, requested the controller and Commissioner Keating to examine his sureties for the due performance of his contract. They refused to do so on the ground that he was not legally the contractor, as his bids had not been opened by Commissioner Haffen and had not been opened publicly. Judge Pryor said that it is to be assumed that in requiring bids to be opened publicly by the responsible officer, instead of privately by an irresponsible subordinate, the legislature introduced a security for the public interest, by providing against the possibility of fraud and imposition. The only safeguard of the public trust is to hold officials strictly within the limits of their defined powers and to compel an exact performance of their prescribed duties. If the physical act of opening the bids may be done by a deputy, it must still be done publicly, and in the presence of the commissioner, and he had no authority to accept that of the relator.

Suburban Extension.

Some interesting information regarding suburban extension was contained in some statistics which appeared recently in the North American Review, which are, in part, as follows:

"Chicago used to have the largest administrative district in the world till the formation of Greater New York. It had an area of 189 square miles, but now New York has taken in 360 square miles. The administrative district of London contains 118 square miles; Philadelphia has 129 square miles; Paris, 30; Berlin, 24. Vienna recently added suburbs, with a population of 464,000, to the old city with a population of 800,000. Leipsig added large suburbs lately, as did also Munich, Dresden and Hanover. The spread of population to the suburbs is shown by the falling off in the rate of increase of

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The statistics of London show that the central area has decreased in population: while the population of outer London has increased 50 per cent., and of Greater London 20 per cent. Greater London, the metropolitan police district, contains 690 square miles, and includes every parish any part of which is within 12 miles of Charing Cross. In Berlin the same falling off of the town proper is noticed, for in five years the town increased only 6 per cent. and the suburbs 60 per cent. In New York this is also noticeable. All this means that the movement toward suburban annexation is not a fad, but is simply the legal recognition of new economic conditions. It means that the people all over the world are seeking for a healthier life than that which they can get in large towns. Australia is the paradise of suburban existence, for two-fifths of the population live in the capital cities. The suburban population of Sydney is nearly three times the city population, but with the bicycle and the trolley car it is just as easy to live in comfort outside the town as to live in discomfort inside."

Spitting on Streets Forbidden.

The bureau of police and health officers of Pittsburg, Pa., have placed conspicuously around that city printed signs requesting all persons not to spit on the sidewalks or street crossings. This effort is made in the interest of public health, and if it does not have the desired effect an ordinance will probably be passed fixing a penalty for spitting on the sidewalks.

Good Roads Exhibition in Minnesota.

The Good Roads Association of Minnesota will have permanent headquarters at the state fair grounds, where practical illustrations will be given in the art of scientific road-building. The structure will be a commodious and substantial affair, and will contain an exhibit of surveyors' instruments, model stone-crushers, road graders, levelers, scrapers and other necessary machinery for road-building, besides a selection of literature bearing upon the subject of good roads. Practical tests will be made, also, and the fair association has planned to profit by the work of the machines. James T. Elwell of Minneapolis is president of the association.

Flow of Water Through Pipes.

In a paper read before the Western Society of Engineers, entitled "Locomotive Water Supply," Theodore W. Snow of the U. S. Wind Engine and Pump company gave some examples of the variation between the theoretical flow of water through straight, smooth pipes and the actual flow. He said:

"In designing a water station for a large railroad recently, the problem given was to obtain 4,000 gallons per minute through a distance of 350 ft., the head and size of supply pipe to be sufficient to accomplish this result. The mean head of water supply was made 38 ft.; from this must be deducted 12 ft. for hight of crane, leaving a net head of 26 ft. In computing this flow an allowanace of 10 per cent. was deducted for the friction of the water column. In figuring this discharge, Mr. E. E. Johnson's curve of discharge was used, and comparing actual result with theory, we fell short only 400 gallons per minute.

"This is pretty fair for practice, for considering that all table makers are careful to state than only 'straight, smooth pipes were used' (they want no 'curves'); we laymen have to make due allowance for the cast pipe of commerce, which usually is anything but smooth and not always straight. The bell and spigot connection causes considerable disturbance to the flow, setting up what in electrical parlance would be termed Foucault currents. In the station just referred to, the supply pipe was 12 in. in diameter and the crane 10 in.; the distance, as stated, was 350 ft., and the discharge was 1,600 gallons in 25 seconds, or at the rate of 3,840 gallons a minute. Under the same conditions with 1,000 ft. of 12-in. pipe and a similar crane, this flow was reduced to 3,000 gallons per minute, due solely to friction. Comparing this again with Johnson's curve, above referred to, we find that we should have obtained 3,300 gallons. Again with 350 ft. of 14-in. pipe and a 12-in. crane, with three 90-deg. elbows, we obtained a discharge of 3,500 gallons in 48 seconds, with a net head of 12 ft. A comparison of the same tables will show a uniform discrepancy."

Driven Wells Exhaust an Ice Pond.

The appellate division of the Supreme court of New York has affirmed a decision made in a jury trial, awarding $1,800 damages to Walter R. Smith, who brought suit against the former city of Brooklyn, N. Y., alleging that an artificial pond, from which he obtained ice, had been dried up by the driven wells sunk by the city a few years ago.

Rules for Maintenance of Macadam Pavements.

For the proper maintenance of macadam pavements the Road Improvement Association of London lays down the following rules:

1. Never allow a hollow, a rut or a puddle to remain in a road, but fill it up at once with chips from the stone heap.

2. Always use chips for patching and for all repairs during the summer months.

3. Never put fresh stones on the road, if by cross-picking and a thorough use of the rake the surface can be made smooth and kept at the proper strength and section.

4. Remember that the rake is the most useful tool in your collection, and that it should be kept close at hand the whole year round.

5. Do not spread large patches of stone over the whole width of the road, but coat

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the middle, or horse track, first, and, when this has worn in, coat each of the sides in turn.

6. Always arrange that the bulk of the stone may be laid down before Christmas.

7. In moderately dry weather and on hard roads, always pick up the old surface into ridges six inches apart, and remove all large and projecting stones before applying a new coating.

8. Never spread stones more than one stone deep, but add a second layer when the first has worn in, if one coat be not enough.

9. Use a steel-pronged fork to load the barrows at the stone heap, so that the siftings may be available for "binding" and for summer repairs.

10. Never shoot stones on to the road, and crack them where they lie, or a smooth surface will be out of the question.

11. Go over the whole of the new coating every day or two with the rake, and never leave the stone in ridges.

12. Remove all large stones, blocks of wood and other obstructions (used for diverting the traffic) at nightfall, or the consequences may be serious.

13. Never put a stone upon a road for repairing purposes that will not pass freely in every direction through a two-inch ring, and remember that still smaller stones should be used for patching and for all slight repairs.

14. Recollect that hard stone should be broken to a finer guage than soft, but that the two-inch guage is the largest that should be employed under any circumstances where no steam roller is employed.

15. Never be without your ring guage. It should be to the roadsman what the compass is to the mariner.

16. If you have no ring guage, remember MacAdam's advice, that any stone you cannot easily put into your mouth should be broken smaller.

17. Use chips, if possible for binding newly-laid stones together, and remember that road sweepings, horse droppings, sods of grass and other rubbish, when used for this purpose will ruin the best road in creation.

18. Remember that water-worn or rounded stones should never be used upon steep gradients, or they will fail to bind together.

21. See that all sweepings and scrapings are put into heaps and carted away immediately.

22. Remember that the middle of the road should always be a little higher than the sides, so that the rain may run into the side gutters at once.

23. Never allow the water tables, gutters and ditches to clog up, but keep them clear the whole year through.

24. Always be upon the road in wet weather, and at once fill up with "chips" any hollows or ruts where the rain may lie.

25. When the main coatings of the stone have worn in, go over the whole road, and gathering together all the loose stones, return them to the stone heap for use in the winter to follow, for loose stones are a source of danger and annoyance and should never be allowed to lie on the road.

A City's Liability for Bad Brick in a Sidewalk.

Suit was brought against the city of South Bend., Ind., recently, to recover damages for injuries sustained by a woman who stepped upon a loose brick in a sidewalk, which turned under her foot. The special findings of the jury showed that this particular defect was not known to the city, and, under these circumstances, the appellate court held that it would be a severe rule which would require a city, by its officers, to examine each brick in a sidewalk, to ascertain its condition when there was nothing to indicate a defect in the brick itself or in the manner in which it was laid, and where the walk was even.

Brooklyn Bridge Overburdened.

The Brooklyn bridge, which is so designed and built that, if overburdened, it will give ample notice of danger, sounded a keynote July 28, when the combined weight of a number of vehicles and trolley cars which became blockaded on it caused the main understay to buckle and bend eight inches out of line about 200 feet from the Brooklyn tower. The task of investigating the structure's safety was entrusted to the joint committee on railroads and bridges and tun-

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lower chorals have in several instances caused a buckling of the two channels forming the choral. This is not new, having been noticed and taken care of before; and, as the trusses form no part of the supporting strength of the bridge, which is in the cables alone, it is entirely safe to assume that the bridge is as strong today as it has been at any time since its erection."

Commission on Pollution of Passaic River.

A new commission has just been appointed by Acting Governor Foster M. Voorhees of New Jersey to consider the pollution of the Passaic river. This is the third commission appointed for this purpose. It consists of eight members, who are as follows: William T. Hunt, editor of the Newark Sunday Call; H. C. H. Herold, president of the Newark board of health; Charles W. Fuller, city attorney of Bayonne; James A. Exton, M. D., of Arlington; William Kent, M. Am. Soc. C. E.; Elias J. Marsh, M. D.; John Hinchliffe, mayor of Paterson, and Charles F. Harrington, Bergen county. The members of the commission are to receive not over $1,000 per year for their services, and may expend $25,000 in their work, subject to the approval of the governor of the state.

An Interesting Question as to the Taxation of Water Works.

The question of taxation of water works property in one district, but belonging to another, brought out some interesting legal points recently in Great Britain. The corporation of Liverpool appealed to the high court against assessments made for the benefit of the poor of Hanwyydu. The question at issue was as to whether the Vyrnwy reservoir and works were to be treated for taxation as integral parts of the Liverpool water system or as severable from the rest of the undertaking. The court was of the opinion that such part of the water works as lay within the parish was a separate ratable hereditament in it, and should be rated accordingly upon an estimate of the rent which it would yield after making the statutory deductions. But it must be taken that the reservoir and works were part of the whole undertaking for the purpose of distributing water as a source of profit; and, though they did not directly earn anything in the parish, yet they conduced to earnings elsewhere. The whole undertaking continued in operation, and therefore the owner of the whole must be assumed to pay a contractor adequate remuneration for land and fixed capital vested in these parts of the undertaking, and for the labor and skill required for their construction and maintenance. The reservoir and works were integral portions of the undertaking, and, though ratable separately, were not to be valued apart from the rest of the undertaking.

A California Pavement Worn Away by Sweeping.

The inspector of street sweeping at Los Angeles, Cal., expresses the opinion that unless some other means of cleaning the porphyry streets of that city than by sweeping them with machines is soon adopted by the city council a number of streets of that character will be ruined. He has made a careful examination into the matter and says the effect of machine sweeping on these streets has been to tear off much of the surface, leaving the bare rock unprotected, and this is soon ground to dust by the heavy travel. In the course of his investigations the inspector visited the street sweeping contractor and found that he is building a roadway with the material which he has taken from the streets.

Cement Tests in the Royal Testing Laboratory.

Mr. Max Gary of the Royal Testing Laboratory of Berlin has been investigating accelerated cement tests to determine constancy of volume. The tests made were as follows: First—Drying test in which 100 grams of cement were mixed and placed in a thin cake on a sheet of moist blotting paper lying on a flat glass or metal plate; after setting, the cake is kept in moist air for 24 hours and then heated to 212 degrees Fahrenheit until all the water is driven off. Second—Glow test in which 300 grams of cement are mixed with water into a ball; this is placed on a plate of plaster of paris over a thin iron plate, and heated by a Bunsen burner until all the water is driven off. Third—Boiling test in which 100 grams of cement are made into a thin cake, placed in a moist atmosphere for 24 hours, then immersed in water, which is gradually raised to the boiling point, and kept there for three hours. A comparison of these tests with those for compression and tensile strength led Mr. Gary to the conclusion that a cement may fail under any of them and yet prove reliable in ordinary practice. Inquiries as to the behavior in practice of the cements which accelerated tests indicated as suspicious have shown that not one had proved unreliable.

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Experiments in Obtaining Gas for Public Lighting from Sewer Sludge.

Some experiments made by Edward A. Harmon of the city gas works of Huddersfield, with a view to ascertaining whether there were sufficient gases in the sewage sludge of that place to make it worth carbonizing, showed that after a six-day test from 3,680 to 7,200 cubic feet of gas were made per ton of sludge. Its candle power ranged from 7.6 to 16.7, and it contained from 25 to 63 per cent. of moisture. The average moisture in the material was 33 per cent., and the sludge contained large quantities of minute organisms, and as but 5,540 feet of gas of an illuminating power of 12.92 candle was obtainable per ton, on an average, it was not economical to do anything with the refuse.

Can a City Engage in the Plumbing Business?

A suit brought against the town of Waycross, Ga., has been decided against it by the state supreme court. The suit was brought by a citizen, who, when the water works system was built about five years ago, succeeded in building up a business as a plumber. The local water commissioners, claiming that he was unskilful, incompetent and his work unsatisfactory to the patrons of the water system, entered into the plumbing business in their official capacity. In justification of their act they claimed that an act authorizing the city to establish and maintain a system of water works and creating a board of commissioners to control it conferred full power on the municipal authorities to do everything necessary to bring about this result. As "a citizen and tax-payer" the citizen brought suit to enjoin the city's officers from carrying on these business operations, which he claimed were ultra vires. The supreme court ruled that the primary design in creating a municipal corporation is to afford a means of performing certain public functions as a subordinate branch of government, while it is invested with full power to do everything incident to a proper discharge of these functions, no right to do more can ever be implied. Its legitimate duty is to deal with public affairs and not those which are purely private and entirely unconnected with a proper administration of its governmental duties. A legal pitfall was avoided by the

Collection of Ashes and Street Sweepings.

The executive board's investigation in regard to the collection of ashes and street sweepings by the street department force, in Rochester, N. Y., is developing some interesting facts. Testimony that has been taken goes to show that many wagons are sent to the dumps with only half and three-quarter loads, in order that more loads may be drawn in a day. A comparison of tables on the relative ash and dirt collections of 1897 and 1898 shows that more loads were drawn off during 1898 than in 1897, with apparently the same working force.

Legal Standard for Paving Brick.

Judges Hosmer, Carpenter and Lillibridge decided against the board of public works of Detroit, Mich., in a suit brought by Holmes & Strachan to restrain the city from entering into a contract with John McLaughlin as the lowest bidder for paving Atwater-st. The sole question for the determination of the court was whether the limitation of the brick was in violation of charter provisions requiring contracts of this nature to be let to the lowest responsible bidder. The advertisement required each bidder to restrict his proposals to three kinds of brick, the Nelsonville, Metropolitan and Century. The court decided that while satisfied beyond question of the good faith of the members of the board of public works, that the restriction of the bidder to brick made by three manufacturers is, in effect, the same as a restriction to one, and creates a monopoly which at once extends to at least a part, if not the whole contract. The specifications provide that only such brick shall be used as are approved by the board of public works, and, having approved of these bricks made by different manufacturers, they asked for bids for a pavement made of either of the three kinds of brick; that this is illegal; that is to say, three kinds of brick by name cannot be selected for use in paving, and if three cannot be chosen, then ten brick by name cannot be selected. In the court's opinion, a standard may be adopted and the bricks which come up to the standard may be used, and any brand may be adopted as the standard.

A Bureau of Meter Tests in Brooklyn.

A bureau of meter tests will be established

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is understood, has been placed in the charter at the request of the different gas and electric companies for their own protection. All gas and electric lights furnished for the city's use will be tested. H. S. Wynkoop, who is at the head of the bureau of electricity, has been placed in charge of the meter-testing bureau.

Steel Shield for Chicago's Great Sewer.

The great steel shield for the Thirty-ninth-st. sewer at Chicago, Ill., has been in course of construction for several months. It has a diameter of twenty-four feet and ten inches, with the outer rim composed of one-inch steel, tested to a pressure of 55,000 pounds to the square inch. Within the steel circlet three platforms will be constructed and divided into eight compartments, and upon these the workmen will be stationed when the shield is in operation. The forward edge of the great circle is sharpened and all the projecting edges of the platforms are sharply pointed. The shield will be forced ahead into the ground by forty-eight hydraulic jack-screws. The soil which is gathered within the shield will then be passed through two doors near the bottom of the rear wall of the machine, and then carried to the opening admitting to the water air, which will be a great distance away when work has proceeded. Ten feet to the rear of the shield air locks will be constructed to keep out the water, and the men within the cylinder will work in an atmosphere of compressed air. Electric lights will be passed within the shield and squads of men will be on duty constantly. Immediately behind the air locks, and in that portion of the bore completed by the excavations, masons will follow and lay the brick conduit. The outer rim will be composed of hemlock timber 3 by 6 inches in size, and cut in segments and then spiked together so that the proper cylindrical form may be secured. Within this rim five thicknesses of brick will be laid. The shield system has never been used in Chicago before, and the leading cases where it has been used were in the St. Clair tunnels, at Port Huron, Mich., and under the Thames, near London.

Technical Meetings.

The first annual convention of the Central States Water Works Association will be held at Springfield, O., September 27, 28 and 29. John Fisher, Secretary, P. O. box 203, Hamilton, O.

The Society for the Promotion of Engineering Education held its sixth annual convention at the Massachusetts Institute of Technology, Boston, Mass., Aug. 18, 19 and 20. Some of the papers presented were as follows: "Notes on the Organization of an Engineering Laboratory," H. B. Smith; "Some Phases of Engineering Education in the South," J. J. Wilmore; "The Study of Electricity in Courses Other Than Electrical," J. P. Jackson; "Laboratory Instruction in Electrical Engineering for Civil Engineers," W. R. Hoag; "Notes on Some Methods in Use in an Engineering Laboratory," F. C. Caldwell; "Sanitary Science as a Part of Every Science Course," W. T. Sedgwick.

The annual meeting of the American Street Railway Association will be held in Boston, Mass., Sept. 6-9.

The annual convention of the Association of Edison Illuminating Companies will be held at Sault Ste. Marie, Mich., Sept. 12-13.

The Missouri Good Roads and Public Improvement Association will hold a convention, Sept. 8, in St. Joseph, Mo. H. Moore, Prest.

The sixth annual convention of the Pacific Coast Gas Association was held at San Francisco, Cal., Aug. 19-20. Officers were elected as follows: President, Chas. F. Adams, Portland, Ore.; vice-president, J. Clements, Red Bluff, Cal.; secretary and treasurer, John A. Britton, Oakland, Cal.

The first annual meeting of the American section of the International Association for the Testing of Materials was held in Philadelphia, Aug. 27. The officers of the American section are: Chairman, Prof. Mansfield Merriman; vice-chairman, Prof. Henry M. Howe; secretary, Richard L. Humphrey; treasurer, Paul Krenzpointer; members of international advisory council, Dr. R. G. G. Moldenke and Prof. Henry M. Howe.

At a meeting of the Civil Engineers' Club of Cleveland, held Aug. 9, a paper on "Test Meters for Boiler Plants" was read by Lehman B. Holt, who, after describing the requisites of a water meter as attached to a service pipe to measure the total consumption, emphasized the importance of accuracy of record in meters used to measure boiler feed water. A Worthington meter was exhibited and described, and blue prints of the Worthington steam accumulator were exhibited, by request, and its construction and operation described.

New Publications.

Fourth Annual Report of the American Society of Municipal Improvements.

The report of the Nashville meeting of the American Society of Municipal Improvements, just published, makes a volume of 336 pages, in addition to which there are a number of diagrams and plates illustrating

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the text. It gives a complete verbatim report of the papers and discussions at the meeting and is a valuable document to municipal officials.

Annual Report of the Water Department of the City of Galesburg, Ill., for the fiscal year ending March 31st, 1898.

The financial statement of the superintendent, W. F. Inness, shows that the total cost of construction of the Galesburg works, up to date, have amounted to $227,811.20. The superintendent expresses a preference for rotary meters. The water pumped during the year increased over 31,000,000 gallons, accounted for by added service connections.

Report to the Director of Public Improvements on Improvement and Repairs to the West Side Levee, Columbus, O. By Julian Griggs, Chief Engineer.

The city of Columbus has experienced much trouble from overflows of Scioto river. In his report Mr. Griggs recommends that what are known as the West Side levees and the railroad embankments which act as levees be raised six feet above the highest stage of flood water, and that the railroad crossing in that region be elevated so as to separate the grade of the streets by passing the railroads over them. The report sets forth complete data in support of his recommendations, which are fully and clearly discussed for the information of those concerned.

Twenty-fifth Annual Report of the Board of Public Works to the Common Council of the city of Grand Rapids, Mich., for the fiscal year ending April 30, 1898.

The report of City Engineer Ames shows that the total cost of street improvements on which contracts have been awarded will amount to $232,928. The cost of sewers during the year was $14,860 and on water works construction, $26,859.

PERSONAL INFORMATION.

CASE—The information that Mr. L. N. Case has been deposed from the position of superintendent of the Detroit water works will be rather astounding to the water works people of the country, among whom he was widely known. According to Detroit newspapers the change has been brought about by political influences, which constitute such a serious menace to good servants of the public in American municipalities and which are constantly working mischief. Mr. Case has been officially connected with the Detroit water works for thirty-one years and is recognized as one of the most capable water works managers in the country. When eighteen years old he enlisted as a private in the federal army, and advanced, step by step, to the rank of captain. As such he was in command of his regiment April 2, 1865, when but twenty-two years of age, in a charge on the enemy's works and so distinguished himself as to be brevetted major by order of Gen. Parke, commanding the Ninth Army Corps. He returned home at the close of the war and obtained an appointment as After deposing him as Superintendent, the water commissioners assigned him temporarily the duties of acting secretary while the secretary is absent on duty in the army.

GREENE—Among the most recent promotions in the army made on the order of President McKinley is that of Brigadier-General F. V. Greene, who is advanced to a Major-General. Gen. Greene is the President of the Barber Asphalt Paving Company. He entered the military service for the Spanish war as Colonel in command of the Seventy-first regiment of New York. Soon after going with his regiment to Florida he was promoted to the rank of Brigadier-General and was sent to Manila in charge of the second expedition. He was one of the distinguished heroes in the battle at Manila which resulted in a victory for the American army, and his promotion to the rank of Major-General is in recognition of his services on that occasion. A sketch of Gen. Greene appeared in the July number of this magazine, in which it was predicted that he would rapidly advance in rank.

BLACK—The mayor of Columbus, O.,

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to them, and declared himself at Detroit against countenancing the irregularities. After he had been elected president and had accepted the office, the League took action which was contrary to what had been well understood to be his position and judgment. He has expressed the determination to try

SAMUEL L. BLACK,
MAYOR OF COLUMBUS, OHIO.

to put the organization on a higher plane and to relieve it from its embarrassments. Hope for its reform and possible usefulness rests largely on what he may be able to accomplish in this direction. Mr. Black is a young man, about 37 years old, and prior to his election was engaged in the practice of law.

SUTRO—Adolph Sutro, ex-mayor of San Francisco, Cal., died Aug. 8, aged sixty-eight years. Ex-Mayor Sutro was known as the "Grand Old Man of the Pacific Coast." He was born at Aix-la-Chapelle, Prussia. He received a liberal education, and, after business reverses in his own country, he came to the United States, starting almost immediately for California. He engaged first in mercantile pursuits, but later in mining

POULLAIN—Mr. F. N. Poullain of Paris, France, has been making a tour of the leading cities of the United States during the last three months for the purpose of gathering information on street-cleaning methods in this country, and has been giving special attention to machinery of this kind, with a view to introducing some of it in Paris. He reports that he has been favorably impressed by his observations and will return with some valuable information.

Personal Notes.

J. Foucart has been appointed city engineer at Guthrie, Okla.

Prof. E. E. Lawson has established an office as civil engineer and surveyor at Dayton, Pa.

J. C. Hoggett has been elected water commissioner, to succeed R. J. Gross, resigned, at Dunkirk, N. Y.

George V. Lorings has been appointed city engineer at Decatur, Ill., to succeed Mr. Dickinson, resigned.

H. H. Flagler has been elected president and A. A. Kelly secretary of the water company at Fond du Lac, Wis.

J. F. Bertles has been re-elected superintendent of the Green Bay Water Works company at Green Bay, Wis.

A. E. Carlton has been appointed trustee and William Gilpatrick manager of the water works at Altman, Col.

Edwin G. Nicewaner has been appointed chief engineer of the meter division of the water department at Chicago, Ill., to succeed H. C. Larrabee, resigned.

Benjamin G. Ingalls, Chas. S. Haskell and M. V. B. Jones have been appointed water commissioners at Swampscott, Mass.

Mrs. Sophia Braeunlich, business manager of the Engineering and Mining Journal, died at her home in Brooklyn, N. Y., Aug. 11.

Robert Campbell Gemmell, M. Am. Soc. C. E., Salt Lake City, Utah, has been appointed State Engineer by Governor Wells.

William Gardner, engineer for gas plants and manufacturer for fire clay materials for gas works, formerly of Pittsburg, Pa., died at his home in Colorado Springs, Col.

Edward M. Bigelow, M. Am. Soc. C. E., director of the department of public works, Pittsburg, Pa., sailed for Europe Aug. 13.

E. Anderson has been appointed city electrician and chief engineer of the water and electric light plants of Grand Forks, B. C.

Walter C. Allen, formerly inspector of electric lighting in Washington, has been appointed electrical engineer of the District of Columbia.

Jacob L. Kuehn has severed his connection with the York Water company, York, Pa., of which he has been superintendent for a number of years.

Capt. James C. Sanford, Corps of Engineers, U. S. A., has been placed in charge of the construction of a military road at

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have also been appointed members of the board.

W. M. Deutch, recently with the New York Filter Manufacturing company, New York City, has been appointed general manager of the Continental Filter company.

Ernest W. Bowditch, Jun. Am. Soc. C. E., Boston, Mass., has resigned his position as consulting engineer and landscape gardener of the park board of Cleveland, O.

Charles F. Leland, Erastus Upham, Gales Gilbert, Harrison E. Smith and C. E. Duncan have been appointed commissioners of the water and light department of Duluth, Minn.

Clifford Lewis, Jr., city surveyor at Utica, N. Y., has resigned to accept the position of inspector of bridges on the middle division of the New York Central & Hudson River R. R.

Joseph T. Lowry has been elected to serve the unexpired term of Thomas E. Veal, chief inspector of the sanitary department of Atlanta, Ga., who has resigned to accept a position with the Thackeray Incinerating and Fertilizing company of San Francisco.

J. W. Beardsley, C. E., has resigned his position with the sanitary district of Chicago to accept that of assistant engineer under the Board of Engineers on the Deep Waterways Commission, with headquarters at Ogdensburg, N. Y.

W. C. Drake has been appointed superintendent of the asphalt paving works for the Barber Asphalt Paving company in Sioux City, Ia., to succeed E. B. Demarest, who has gone to Kansas City, Mo., to accept a similar position.

MACHINERY AND TRADE.

Recent Inventions.

(Reported specially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for 10 cents.)

608,405—Aug. 2, 1898—Hoisting and Conveying Apparatus for Excavating. P. N. Jonte, Cincinnati, O.

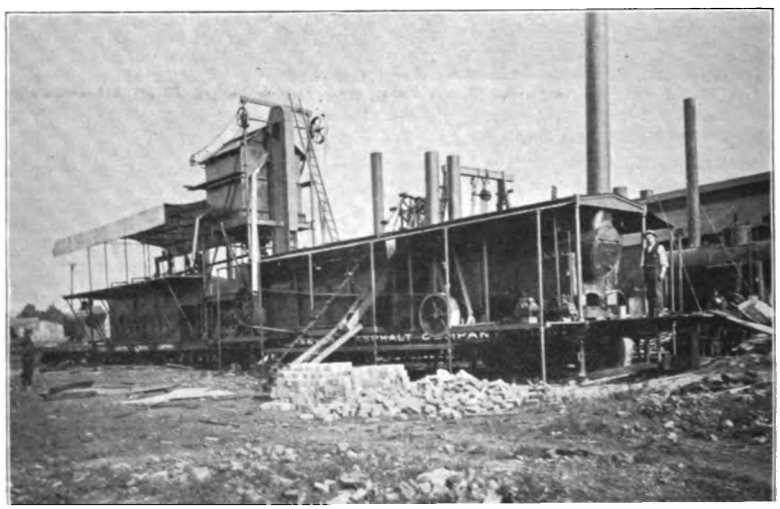
609,001—Aug. 16, 1898—Construction of Metal Bridges. Walter Beer, London, England.

A hand machine carrying a rotary brush at its forward end.

609,182—Aug. 16, 1898—Dumping Vehicle. W. A. Cowley, Benicia, Cal., assur. to Baker & Hamilton Company, San Francisco.

A semi-cylindrical body which may be swung about a horizontal axis.

609,321—Aug. 16, 1898—Apparatus for Raising Sewage. S. H. Adams, London, England.



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sweepers in that city: "Last winter the representatives of the Indianapolis Street Cleaning company made a one-sided contract with the city of Rochester, to sweep asphalt, Medina block or brick pavements, guaranteeing to take up all the fine dust and other dirt, and failing to do so the city of Rochester have the right to cancel said contract at any time without loss to the city. The two pneumatic machines came, one May 1st and the second June 1st. The first month the bill to the city was about $259.97, and it swept five miles of the streets of Rochester every night of the month of May, and paid to the citizens of Rochester employed to run said machines $300 in wages. During the month of June, while two machines were being used, the bill to the city was $849.27, and they swept acceptably ten miles of streets each night, and paid to the citizens of Rochester employed to run them $780 in wages. In July the city paid $1,030 and the owners of the machines paid over $800 to Rochester citizens in wages. The city has also had men on the streets in the day time, and any person living on an asphalt street will tell you that since the machines have been placed on their streets they have not been covered with dust as they were when the city had only hand labor on it. The man who says the machines will injure an asphalt pavement doesn't know what he is talking about. I am an asphalt contractor and I know that the suction of air, which is the principle of the machine cannot injure any pavement. The steel brushes only loosen up any horse droppings and have nothing to do with the sweeping. The Furnas pneumatic street sweeper has never been tried and thrown out of any city in the United States. Also, there has been no small contractor thrown out of a job by the machines, as the machines have only swept the streets that were placed in the hands of the executive board by the common council to take care of out of the highway fund."

Paving Bricks from Copper Slag.

The Mansfield Copper company in Eisleben, Thuringia, has placed on the German market a paving brick made from copper slag. The slag is led directly from the smelting furnaces into iron moulds possessing a capacity of thirty-six bricks each. If it were poured into cold moulds and allowed to cool off in the air it would become a useless glassy mass, so hard and brittle as to be unable to stand ramming and the shock of wagon wheels. The moulds have, therefore, to be well heated if a good brick is to be obtained. Immediately after pouring, the moulds and their contents are thickly covered with sand and allowed to stand undisturbed for at least seventy-two hours. It requires this time to make the bricks cool enough to be taken out of the moulds with tongs, and they have then gone through a regular annealing process. After having fully cooled each brick is tested by a strong blow with a hammer, and those containing blowholes crack. These bricks are said to be fully equal to granite, and possess the further advantage of regular shape and sharp edges so that they can be joined very closely.—Engineering and Mining Journal.

Trade Notes.

The Sharon Clay Mfg. company, Meadville, Pa., has resumed operations.

The Thomas Millan & Co. Portland Cement Works of Wayland, N. Y., is being enlarged.

The common council at Scranton, Pa., is again talking of purchasing an asphalt repair plant.

A large kiln of the Galesburg Paving Brick company, Galesburg, Ill., was struck by lightning recently.

A Portland cement plant has been erected on Green Island, China, near Hong Kong, by an English syndicate.

The asphalt yards of Booth & Flynn, Pittsburg, Pa., were damaged by fire Aug. 2, causing a loss of about $4,000.

The question of erecting a plant to develop the deposit suitable for cement manufacture, which has been found near Mulvane, Kas., is receiving consideration.

Press reports state that all of the paving brick factories east of Galesburg, Ill., may resume work within a short time.

The Lower Brick company, Sioux City, Ia., has been incorporated by W. B. Lower, S. R. Clarke, E. W. Rice and A. L. Steison.

The New Castle Block Asphalt company, New Castle, Pa., contemplates the establishment of a branch factory in Sandusky, O.

A stone crushing plant has been established in the "North Woods," about 1½ miles east of Le Roy, N. Y., by the Lehigh R. R. company.

The Central Grading company, San Fransisco, Cal., has been incorporated by John Mahoney, John H. Conley, Joseph Oliva, A. Sharkey and Jas. McGinley.

The South Bend Portland Cement company, South Bend, Ind., has been incorporated. The directors of the company are John Lux, Chas. H. Atkinson, Aman Moore and Lee W. Atkinson.

The Rincon mines of the Alcatraz Asphalt company, which are situated about eight miles from Santa Barbara, Cal., have resumed operation and will be extended as fast as conditions will allow.

Plans are being prepared by Lathbury & Spackman, consulting engineers, for the proposed plant of the Alma Portland Cement company of Wellston, O., for the manufacture of cement. C. K. Davis is interested in the enterprise.

The injunction restraining Cornelius N. Bliss, Secretary of the Interior, and William A. Jones, commissioner of Indian Affairs,

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from declaring at an end a mining lease in Utah, held by the American Asphalt company, was dissolved July 29 by Justice Hagner in Equity Court No. 1.

A judgment of $8,000 has been awarded the Atlas Clay Material company of Chicago in its suit for $20,000 against the Ohio Vitrified Pipe company. The amount asked for was commission, with interest, from Jan. 1, 1895, for selling the product of the United States Clay company of Lisbon, O., in various parts of the United States. The plaintiff company had a contract with the company to sell its goods, for which it was to receive a commission of 15 per cent., but it never received any part of such commission when the United States Fire Clay company became insolvent and a receiver was appointed two years ago. When the stockholders organized the Ohio Vitrified Pipe company for the purpose of carrying on the business and assuming all liability of the old company the Atlas company instituted suit for judgment.

SELECTIONS FROM THE PRESS.

Reformed Municipal Bookkeeping.

Last week the League of American Municipalities had a meeting at Detroit, and recreated itself by uttering and hearing a lot of talk about various municipal and miscellaneous reforms and improvements. The Hon. Potato Pingree radiated wisdom over the august assembly, and the inevitable Socialist professors were on hand with their usual invoices of sentimentalism and "sociology." In short, much thought was discharged.

Even among thinking reformers and reformed thinkers and municipal leaguers, the election of officers has its excitements. The spirited manner in which the Hon. B. F. Gilkison was re-elected as secretary of the League sufficiently marked its capacity for improving municipal government. The auditing committee had made a report "criticising Secretary Gilkison's laxity in keeping his accounts and his failure to turn over the dues to the treasurer. The committee found nothing wrong with his accounts, and had no reflection to make upon his honesty or integrity." * * * Evidently the League of American Municipalities intends to reform mtunicipal bookkeeping, making it more genial and less painfully businesslike.—The New York Sun.

A Bright Business Outlook.

When in our history has the business outlook of the country been so conspicuously favorable as at this moment? When has there been such a conjunction of fortunate influences of the first magnitude?

Then the national domain and the national wealth are about to be augmented by the acquisition of Porto Rico, a highly productive island 50,000 miles in extent, with two and one-half millions of population, yielding coffee, sugar, fruits, nuts and tobacco. It has an export and import trade aggregating $36,000,000 annually, and is capable under American management of increasing immensely in population, productiveness and wealth.

We have a credit balance of six hundred million dollars in our trade with foreign nations for the fiscal year just closed. We owe far less abroad than we have owed at any other time in the last fifteen years, because we have been buying back our securities, and buying them cheap. Accordingly we have less interest money to pay to foreigners. Already gold imports have begun, a most unusual thing for this season of the year. But Europe has no other way of paying its debts to us. The offsets that used to eat up our trade balance are not equal to the task of disposing of $600,000,000.

Another great crop is nearing the harvest time, and another year of large exports is before us.

We produced $60,000,000 of gold last year and $33,000,000 worth of silver. The Klondike region has begun to send in its second year's yield, which must be considerably larger than the output last year.

Our money circulation has been very largely increased during the last two years, and the use of the new 3 per cents by the banks will result in important increase in the

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IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Clinton, La.—A committee of three has been appointed by the police jury to plan a system of laws for improving the roads.

Milwaukee, Wis.—The board of public works has admitted Alcatraz asphalt to competition.

Detroit, Mich.—The board of public works announced, Aug. 24, that it will use any brick for paving that the council will select.

Ashland, O.—A committee of councilmen, consisting of O. A. Phillips, C. Smith, H. Tinsley, Wm. Boren, F. L. Neidenhauser and W. B. Dager, visited Columbus, O., Aug. 7, to investigate foundations for street paving.

Lafayette, Ind.—The council committee on streets has decided against creosoted block as a paving material, and is now investigating asphalt block paving, which has been suggested, owing to its adaptability on such grades as exist in this city.

Maryville, Mo.—The Nodaway county branch of the Missouri Good Roads and Public Improvement Association was organized Aug. 18 with the following officers: President, Dr. H. E. Robinson; vice-president, A. E. Alden; secretary, W. F. Smith; treasurer, Jas. B. Robinson.

Liberty, Mo.—The Clay County Good Roads and Public Improvement Association was organized here Aug. 9. The officers are: President, J. J. Stogdale; secretary, B. W. A. Gow; treasurer, D. B. Field. A meeting will be held in September to elect delegates to the state convention, which will be held in St. Louis in November.

Newark, N. J.—The paving laid in this city this year will exceed the amount ever before done in any one year. Of this, 37 streets, having an area of 188,245 square yds., will be asphalt, 17 streets, with an area of 78,831 square yards of granite block, and five streets, with an area of 10,890 square yards, of brick. The cost will amount to $533,575.

Norwich, N. Y.—The property-owners on Main-st., from Court to Adelaide, have issued an injunction against the board of trustees restraining it from letting the contract for paving the street, because of alleged irregularities in the proceedings relative to the paving, which, they claim, would endanger the collection of the taxes assessed. The street was to be paved with vitrified brick.

Sioux City, Ia.—City Attorney Gill favors more competition in paving and is of the opinion that the municipalities of the state should make an effort to have the law so changed that the decision as to the material to be used be left until after bids on different materials have been received and the city has gotten the benefit of the increased competition which would naturally result.

St. Louis, Mo.—Acting President Holman of the board of public improvements is of the opinion that it will be impossible to secure the construction of any new streets during 1898. The adjournment of the municipal assembly for two months without acting on the 22 improvement ordinances passed by the board of public improvements, is the cause of the delay. The assembly re-convenes Sept. 27.

Philadelphia, Pa.—The property-owners on Locust-ave., Germantown, entered a protest Aug. 18 against the alleged excessive price charged for paving that thoroughfare with brick. The pavement has just been completed by the Mack Paving company, who, it is alleged, was awarded the contract three years ago, when property was assessed at suburban rates and before sewer and other improvements had been made. The contract price was $2.06 a sq. yd., while similar work is now being done at $1.39.

Waco, Tex.—The county commissioners are improving the sandy sections of the public roads east of the Brazos river by constructing clay beds on one side of the road for use in dry weather and leaving the other side of the road as it is for use in wet weather. While the improvement is in the nature of an experiment, yet it is not altogether an untried one, for several of the counties represented in the last two annual meetings of the County Judges' and Commissioners' Association reported that this method of improving sandy roads is satisfactory.

CONTEMPLATED WORK.

Rahway, N. J.—Seminary-st. will be macadamized.

Aurora, Ill.—Street paving is urged by the press.

Kenosha, Wis.—Grand-ave. will be paved with brick.

Westminster, Md.—Main-st. will be macadamized.

Sioux City, Ia.—Macadam pavement is contemplated for Fourth-st.

Vineland, N. J.—The construction of a brick road is contemplated.

York, Pa.—An issue of $200,000 bonds for paving is contemplated.

Flint, Mich.—The council has ordered brick paving for Kearsley and Beach-sts.

South Bend, Ind—Paving is proposed for Portage and Leland-aves. and Cushing-st.

Denver, Col.—As an experiment Logan-ave. will be paved with disintegrated granite.

Burlington, Ia.—Brick paving is contemplated for alley No. 1, from Valley to Market-st.

Leadville, Col.—Senator Edward L. Taylor advocates the construction of a state road.

Elgin, Ill.—An ordinance was passed Aug. 16 to pave Chicago-st. with brick. Mayor Price.

Tacoma, Wash.—Surveys have been ordered made for a wagon road 22 mls. long. Co. comrs.

Leavenworth, Kas.—The committee is reported as having decided upon brick for paving Fifth-st.

Springfield, Mo.—The city council has passed an ordinance to pave E. Walnut-st. with brick.

Dayton, O.—The city engineer has been instructed to prepare ordinances for paving two alleys.

Eau Claire, Wis.—An ordinance has been passed for 9,165 sq. yds. of brick paving for this fall.

Minneapolis, Minn.—Brick paving is contemplated for a portion of University-ave. Ald. Lane.

Winnipeg, Man.—Macadam paving is contemplated for Lombard and Arthur-sts., and Gotham-ave.

Mauch Chunk, Pa.—The town council has voted to construct about 700 sq. yds. of Macadam streets.

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New York City.—Asphalt paving is contemplated for Sixth-ave., between Thirteenth and Thirty-third-sts.

Kokomo, Ind.—Bids will be asked soon for 12,000 sq. yds. of brick paving. A. W. Smith, cy. engr.

Welland, Ont., Canada.—Asphalt paving is contemplated for a portion of the roadway in the park.

Marion, Ind.—An asphalt boulevard, from the Public Square to the Soldiers' Home, has been suggested.

Jackson, Mich.—The common council is undecided as yet whether to pave Wildwood-ave. with aspnalt or brick.

Woodbury, N. J.—William N. Carter has been appointed to prepare plans for macadamizing ¾ mi. of Broad-st.

Sheboygan, Wis.—The citizens are urging the question of paving or macadamizing Pennsylvania-ave.

Astoria, Ore.—Resolutions have been adopted for establishing grades on certain streets, Mayor Bergman.

New Kensington, Pa.—The borough council decided to pave Fourth and Fifth-aves., and Ninth and Tenth-sts.

Hazleton, Pa.—The vitrified brick paving on Broad-st. will be extended from 18,000 to 21,000 sq. yds.

Lexington, Ky.—Press reports state that the proposition to pave Vine-st. with asphalt is still under consideration.

Milton, Pa.—An ordinance has been passed to pave Broadway and Front-sts. with brick. William C. Miller, clk.

Council Bluffs, Ia.—The resolution to pave a number of streets with brick came up for final action Aug. 29.

Washington, Pa.—The question of issuing $67,000 bonds for paving next year will be voted on Sept. 17.

Jefferson City, Mo.—Brick paving is contemplated for one block of Machine-st. Ald. McHenry is interested.

Chicago, Ill.—The property owners and business men on N. Clark-st. have petitioned for asphalt paving on that street.

Wauwatosa, Minn.—The common council passed a resolution. Aug. 23, to pave Church-st., from Main to W. Milwaukee-ave.

Pana, Ill.—Paving is contemplated for Third-st., from the Illinois Central railway to Hickory-st., eight blocks.

Waukesha, Wis.—The council has ordered brick paving for Madison, Broadway, South and Clinton-sts. H. E. Blair.

Cincinnati, O.—A resolution has been passed to macadamize Delta-ave., from Linwood road to Center-st., Edwin Henderson, clk.

Newburg, N. Y.—Plans and specifications have been prepared for paving Liberty-st. with asphalt block. D. J. Contaut, cy. clk.

Buffalo, N. Y.—The board of supervisors has voted in favor of macadamizing the White Corners road; estimated cost, $36,400.

Springfield, O.—Resolutions have been

Winnipeg, Man.—Asphalt paving is proposed by the council for Portage-ave., from Main to Hargrave-st.; estimated cost, $54,000.

Racine, Wis.—Macadam paving with stone curbing is contemplated for Kewaunee-st. Cement walks have been recommended for Seventh-st.

Waukegan, Wis.—Press reports of Aug. 16 state that a movement has been started to pave West-st. with asphalt and rename it Dewey-ave.

Lockport, N. Y.—The property owners on Canal-st., between Main and Niagara, have petitioned the common council to pave and curb that street.

Canton, Ill.—A petition has been filed with the city clerk asking that the alley between S. Main-st. and White Court be paved with brick.

Lansdowne, Pa.—The citizens will vote on a proposition to borrow $15,000 for improving the streets. Thos. G. Janier, borough surveyor.

Louisville, Ky.—The board of public works has decided to improve a large number of sidewalks, alleys and streets with brick and block paving.

Durham, N. C.—Resolutions have been passed for paving Main-st. and the sidewalks. Vitrified brick or Belgian blocks will be the material used.

Des Moines, Ia.—A resolution has been adopted for paving Depot-st. with vitrified brick, on 6-in. concrete foundation, with Murphy grout filler.

Boston, Mass.—The street commissioners will grant a public hearing Sept. 1 on the proposed paving of Rockford and Nottingham-sts. at Dorchester.

Scranton, Pa.—The city council has decided, according to press reports, to readvertise for bids for paving River-st., Park Place and Sixth-ave. Cy. clk.

Madison, Wis.—Petitions have been presented to common council for the macadamizing of four streets: W. Johnson and Warren-sts. will be macadamized also.

San Francisco, Cal.—The board of supervisors decided Aug. 15 that the Market-st. Railway company must repair the car tracks on Market-st. with bitumen.

Boonville, Ind.—A resolution was passed Aug. 15 to macadamize Third-st., from Locust-st. to the L. E. & St. L. tracks. Chas. H. Johnson, town clk.

Des Moines, Ia.—The council contemplates improving nine streets at a cost of about $8,000. A petition is being circulated for asphalt bicycle paths.

Atlantic City, N. J.—The city council adopted an ordinance Aug. 15 to pave all avenues with broken stone, with vitrified brick gutters and stone curbing.

Youngstown, O.—Bids will be asked about the middle of September for about 7,800 sq. yds. of sheet asphalt or block paving on Scott-st. F. M. Lillie, cy engr.

Joliet, Ill.—The council has recommended

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sandstone or granite curbing. Correspondence from contractors is solicited. Alexander Oldham, cy. engr.

Champaign, Ill.—The property-owners on University-ave. are agitating the question of paving that street and replacing the brick sidewalks with concrete. Mayor Scott.

Kansas City, Mo.—The park board instructed its secretary Aug. 17 to make preliminary surveys for a 100-ft. boulevard on Cherry-st., from Seventeenth-st. to Brush creek.

Conshohocken, Pa.—The town council has passed an ordinance to pave, curb and gutter Cherry-st., between Elm-st. and the Pennsylvania railroad. Harry B. Heywood, clk.

Joliet, Ill.—A petition is being circulated for the purpose of securing asphalt paving in the alleys in the block bounded by Chicago, Jefferson, Ottawa and Van Buren-sts., this year.

Council Bluffs, Ia.—The city council met Aug. 22 and acted finally upon the resolution for vitrified brick paving on Avenue F, Pierce, First, Bryant, N. Main and Fourth-sts. and Willow-ave.

Cedar Rapids, Ia.—(Special.)—G. H. Meredith, cy. engr., has been directed by the city council to prepare plans and specifications for asphalt paving on First-ave., from Tenth to Thirteenth-st.

Schenectady, N. Y.—Ordinances are before the council for brick paving in three streets, macadamizing North-st. and grading, curbing, etc., in Hamilton-st. Louis R. Sebring, cy. engr.

Niagara Falls, Canada.—(Special.)—C. H. Mitchell, cy. clk., says 8,700 lin. ft. of 6, 8 and 10-ft concrete and brick sidewalks, together with stone curbing and crossings, are soon to be built.

Williamstown, Pa.—An ordinance has been passed by the borough council empowering the council to pave those parts of Broad, Elizabeth, Spruce, Vine, Julian, Ray and Chestnut-sts. not paved by Oct. 2.

Rochester, N. Y.—The council contemplates paving, curbing and constructing sidewalks in portions of Maple, Post, Front and Center-sts., Chili and Hudson-aves. and Immel-place. Edwin A. Fisher, cy. engr.

Omaha, Neb.—The residents of Poppleton-ave. are reported as having decided in favor of asphalt paving. The property-owners on Twenty-fourth-st. want the asphalt paving on that thoroughfare renewed.

Chicago, Ill.—Ordinances have been passed for paving portions of State, Thirty-third and Thirty-second-sts. and Lake Park-ave. with asphalt, and Leavitt-st. with cedar block. L. E. McGann, comr. pub. wks.

Bay City, Mich.—South Union-st., from Washington to Henry, will be paved. Both brick and asphalt are favored. Bids will probably be asked on both board and concrete foundations. Mayor Lind.

St. Paul, Minn.—The board of public works decided, Aug. 18, to report favorably to the council on the proposed paving of Washington-st. with asphalt, provided that work on it will not begin before Feb. 1, 1897.

Hamilton, O.—A resolution has been adopted for paving N. Second-st., from High to Black, and S. Second, from High to Central-ave., with asphalt block, asphalt or vitrified brick. Macadam paving is proposed for Ludlow-st. M. O. Burns, cy. clk.

St. Paul, Minn.—Asphalt paving is contemplated for Nelson, Nina and Farrington-aves., and Kent, Mackubin and Arundel-sts., but it is not the intention to pave them this summer. The board of public works will recommend to council that 6⅝ miles of city streets be paved this year with macadam.

Lafayette, Ind.—The committee on streets reported Aug. 23, that after examination of streets paved with asphalt blocks, it was disposed to let them enter into competition with asphalt, and have asked the council to have paved with them one or more prominent street intersections. D. W. Leslie, Geo. Pfrommer, M. W. Thompson, com. on sts.

CONTRACTS TO BE LET.

Salem, O.—Bids are invited until Sept. 6 for brick paving. Geo. Holmes, cy. clk.

Fremont, O.—Bids are asked until Sept. 5 for brick paving. R. J. Christy, chrmn. com.

Nelsonville, O.—Bids are invited until Sept. 10 for block paving. Jas. Sharp, cy. clk.

Rockville, Md.—Bids will be received Sept. 6 for constructing the Rockville turnpike. Co. comrs.

Cincinnati, O.—Bids are asked until Sept. 2 for macadamizing. A. B. Ratterman, prest. bd. cy. affairs.

Sturgis, S. D.—Bids will be received until Sept. 5 for building a highway. W. A. McMichael, audt.

Hasbrouck Heights, N. J.—Bids are asked until Sept. 6 for macadam paving. G. H. Ramsden, clk.

Watertown, Wis.—Bids are asked until Sept. 17 for 5,700 sq. yds. of brick paving. G. H. Stanchfield, cy. engr.

Port Chester, N. Y.—Sealed proposals will be received until Sept. 6 for paving sundry sts. J. A. Peck, vil. clk.

Mansfield, O.—Bids are invited until Sept. 10 for street improvements and lateral sewers. F. M. Remy, cy. clk.

Cleveland, O.—Bids are asked until Sept. 7 for paving E. Madison-ave. with brick. Geo. R. Warden, dir. pub. wks.

St. Paul, Minn.—Bids will be received until Sept. 5 for paving Rice-st. with macadam. D. M. Sullivan, co. audt.

New Brunswick, N. J.—Bids are asked until Sept. 7 for macadamizing. Jas. M. Powers, dir. bd. chosen freeholders.

Hawley, Minn.—Sealed bids will be received until Sept. 3 for grading 45 rods, more or less. Warren Works, town clk.

South Bend, Ind.—Sealed proposals will be received until Sept. 12 for constructing cement sidewalks. L. A. Hull, cy. clk.

Buffalo, N. Y.—Bids will be received until Sept. 2 for street work in Niagara Square. G. L. Selkirk, secy. park com'n.

Henderson, Ky.—Bids will be received until Sept. 6 for 2,000 cu. yds. of conglomerate gravel. W. I. Thompson, mayor.

Logansport, Ind.—Sealed proposals will be received until Sept. 21 for constructing cement sidewalks. John B. Winter, cy. clk.

Denver, Colo.—Bids will be received until Sept. 6 for paving Champa-st. from Nineteenth-st. to Downing-ave. B. P. W.

Winchester, Ind.—Sealed proposals will be received until Sept. 10 for improving Main and Meridian-sts. William P. Needham, cy. clk.

St. Joseph, Mo.—Bids will be received un-

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til Sept. 12 for grading the St. Joseph and De Kalb road. Theo. Steinacker, co. surv.

Toledo, O.—Sealed bids will be received until Sept. 13 for furnishing 1,225 cords of crushed hard limestone. William M. Godfrey, co. audt.

Richmond, Ind.—Bids are invited until Sept. 2 for constructing a brick walk, stone curbing, etc., in Main-st. James H. Winder, clk.

Monroe, La.—Sealed proposals will be received until Sept. 8 for 7,788 sq. yds. of brick paving on concrete. A. A. Forsythe, mayor.

New York City.—Sealed proposals will be received until Sept. 8 for furnishing paving and rubble stone. J. W. Barlow, col. engrs.

Terre Haute, Ind.—Sealed bids will be received until Sept. 5 for the construction of gravel roads in Lost Creek twp. James Soules, co. audt.

Coshocton, Pa.—Bids are asked until Sept. 10 for 21,000 sq. yds. of brick paving and 6,900 lin. ft. of curbing. F. F. Wagner, vil. clk.

Newton, Ill.—Sealed bids will be received until Sept. 3 for constructing macadamized roadways. C. E. Cook, chm. com'n. highways.

West Shoals, Ind.—Sealed proposals will be received until Aug. 8 for constructing macadam roads in Halbert twp. Horatio Harryman, co. audt.

Omaha, Neb.—Sealed proposals will be received until Sept. 2 for repaving Poppleton-ave. with asphalt, brick or stone. William Coburn, secy. B. P. W.

Keokuk, Ia.—Bids are asked until Sept. 5 for 5,761 sq. yds. of brick paving and 5,338 sq. yds. of macadam paving. G. M Walker, cy. engr.

Carthage, O.—Sealed proposals will be received until Sept. 6 for improving the Hamilton, Springfield and Carthage pike. L. Hall, vil. clk.

Rockville, Ind.—Bids are asked until Sept. 10 for improving six highways, including grading, draining, bridging and graveling. E. H. Owen, co. audt.

Alton, Ill.—Sealed proposals will be received until Sept. 7 for grading, curbing and paving sidewalks on sundry streets. Henry Brueggeman, mayor.

Lafayette, Ind.—Sealed proposals will be received until Sept. 12 for constructing cement sidewalks and improving certain alleys. Thos. W. Burt, cy. clk.

Litchfield, Conn.—Bids will be received until Sept. 5 for Telford paving on a section of road between this place and Morris. Chas. Merriman, selectman.

Glens Falls, N. Y.—Sealed proposals will be received until Sept. 5 for constructing vitrified brick paving on concrete foundation on Glen-st. W. M. Camersu, vil. clk.

Madisonville, O.—Sealed proposals will be received until Sept. 3 for macadamizing, graveling, curbing and flagging Plainville road and Station-st. Bennett Carter, vil. clk.

St. Louis, Mo.—Sealed proposals will be received until Sept. 6 for the construction of granitoid walks in Hyde Park and Benton

Terre Haute, Ind.—Sealed proposals will be received until Sept. 6 for paving the unimproved sidewalks on Third-st. with vitrified brick. Chas. A. Goodwin, cy. clk.

Lake Forest, Ill.—Sealed bids will be received until Sept. 5 for constructing 716 lin. ft. of cement curbing and 7,800 sq. ft. of cement sidewalk. Jas. Anderson, Jr., cy. engr.

Philadelphia, Pa.—Sealed proposals will be received until Sept. 5 for furnishing at Ft. Delaware, Del., cement, broken stone, sand, etc. C. W. Raymond, lieut.-col. engrs., 1426 Arch-st.

Columbus, O.—Sealed proposals will be received until Sept. 6 for paving Fourth-ave. with macadam and paving the gutters with hard-burned brick. Jas. A. Fanning, clk. B. P. W.

Youngstown, O.—Sealed proposals will be received until Sept. 12 for paving Scott-st., between Wick and Belmont-aves., with sheet asphalt or blocks. H. W. Calvin, clk. bd. cy. comrs.

Georgetown, O.—The contract or contracts for improving the 5th, 6th and 7th sections of the Shinkle Ridge and Cedron road, in Lewis township, will be let Sept. 3. H. L. Jennings, co. audt.

Binghamton, N. Y.—Sealed proposals will be received until Sept. 6 for paving Collier-st.., from Courtney to Academy, and Academy, from Collier to State, with brick. Burr W. Mosher, cy. clk.

Kansas City, Mo.—Bids will be received until Sept. 7 for curbing and guttering Benton boulevard, from Independence boulevard to Thirty-first-st., and for constructing 77,000 sq. ft. of granitoid sidewalks. Park bd.

Des Moines, Ia.—Sealed proposals will be received until Sept. 5 for paving Eleventh-st., from Forest to College-ave., 4,700 sq. yds., with brick on concrete, with Murphy grout filler. G. A. Eberhart, chrm. B. P. W.

Toledo, O.—Sealed proposals will be received until Sept. 12 for paving with vitrified blocks on concrete Knower-st., from Broadway to Maumee-ave., and with Trinidad asphalt or vitrified blocks Rockingham-st., from Fulton to Cherry. Lem. P. Harris, cy. clk.

Albany, N. Y.—Bids are asked until Sept. 5 for 11,000 sq. yds. of brick paving on Elm-st.; 6,530 lin. ft. granite curbing, 270 lin. ft. circular granite curbing, 60,000 sq. ft. new brick sidewalk, 10,000 sq. ft. 4-ft. flag sidewalk, six receiving basins. Horace Andrews, cy. engr.

CONTRACTS AWARDED.

Cleveland, O.—M. F. Bramley secured the contract Aug. 2 for paving Bridge-st. with shale brick.

Easton, Pa.—C. H. Lutzen & Sons submitted the lowest bid for macadamizing nine streets, at $47,932.

Pecatonica, Ill.—The contract for macadamizing and curbing Main-st. was awarded to Thos. Dole.

Sing Sing, N. Y.—The contract for asphalt paving has been awarded to the Hastings Pavement company at $2.25 a sq. yd.

Anaconda, Mont.—The contract for con-

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Decatur, Ill.—F. J. McDonald was awarded the contract Aug. 17 for graveling Franklin-st., for $2,341.

Bowling Green, O.—The contract for paving N. Grove-st. with vitrified block was awarded Aug. 9 to A. Graham for $4,732.14.

Bayonne, N. J.—The contract for improving W. 194th-st. was awarded to Rehill & Edward of Jersey City for $29,660.

South Norwalk, Conn.—The contract for brick paving on S. Main-st. has been awarded to W. R. Johnson for $10,000.

Kansas City, Mo.—Contracts for paving alleys were awarded Aug. 11 to Walter Hickman at $1.49 and $1.59 a sq. yd.

Edwardsville, Ill.—Chas. W. Heinrich secured the contract for constructing brick sidewalks in sundry streets for $466.82.

Little Falls, N. Y.—The contract for improving Ray and Loomis-sts. has been awarded to Hallinan Bros. for $14,430.

Macon, Ga.—The contract for 8,000 sq. yds. of brick paving has been awarded to W. S. Lasley of Chattanooga, Tenn., at $2 a sq. yd.

Boston, Mass.—The contract for constructing a Telford macadam roadway in Dorchester was awarded Aug. 15 to J. McGraw & Co., for $14,516.

Milwaukee, Wis.—The contract for replacing the wooden pavement on Galena-st. with macadam has been awarded to C. Froemming for $3,913.

Annapolis, Md.—The contract for paving Prince George, Bladen and Compromise-sts. was awarded Aug. 16 to Joseph Jewell for $4,500.

Phillipsburg, Pa.—The contract for paving 1¾ mls. of streets with brick was awarded to Hugh E. Crilley of Allentown for $30,000.

Ashfield, Mass.—Tuttle & Edgerly, Swampscott, Mass., were awarded the contract Aug. 11 for constructing a macadam road for $4,785.

Lunenburg, Mass.—The contract for building a macadam road was awarded Aug. 18 to C. H. Kelleher of Newburyport for $3,782.

Peterborough, Ont.—A contract for contract for constructing about 5,000 lin. ft. of sidewalk has been awarded to Dolan & Sheehey of Belleville.

Xenia, O.—The contract for constructing about 3 mls. of road has been awarded to Harry Tavener of Clifton at $1,600 a mile.

Denver, Colo.—The contract for grading, curbing and draining Logan-ave. was awarded Aug. 17 to R. J. P. O'Rourke for $19,791.11.

Springfield, Ill.—The contract for building two driveways and curbing around the Wabash depot was awarded to Welch, Patterson & Striffler.

Urbana, Ill.—The contract for paving California-st. has been awarded to J. W. Stipes of Champaign at $1.20 a sq. yd. for Clinton brick.

Warren, Mass.—The contract for building a macadam road was awarded Aug. 11 to John S. Lane & Son of Springfield for $2,822.

Paterson, N. J.—The contract for paving certain streets with asphalt was awarded Aug. 22 to the Paterson Construction Co., at $1.98 a sq. yd.

Cortland, N. Y.—The contract for paving Main-st. with Trinidad sheet asphalt was awarded to the Warren-Scharf Asphalt Paving Company for $71,592.50.

Kansas City, Kas.—The Gilsonite Roofing & Paving Co. of St. Louis, Mo., secured the contract for rock asphalt paving in this city at $2.10 a sq. yd.

Montgomery, Ala.—The Coaldale Brick and Tile company of Birmingham, Ala., has been awarded a contract for furnishing 1,350,000 brick for $25,000.

Louisville, Ky.—The Assyrian Asphalt company of Chicago was awarded contracts Aug. 10 for paving Von Borries and Hepburn-aves. with asphalt for about $21,000.

Danville, Ill.—J. H. Palmer was awarded the contract Aug. 15 for paving Walnut-st. with Danville brick and Payne-ave. and Fera's alley with Clinton brick.

Cleveland, O.—The Alcatraz Asphalt company was awarded the contract Aug. 19 for paving the Superior-st. viaduct with asphalt at $1.67 a sq. yd., or $12,600.

Kenosha, Wis.—The contract for paving Grand-ave. was awarded Aug. 16 to A. E. Rutledge & Co. of Rockford, Ill., at $1.37 a sq. yd. for Purington brick.

San Francisco, Cal.—The contract for paving Market-st., from Second to Sixth, with asphalt, has been awarded to the City Street Improvement company for $13,776.

Galveston, Tex.—The contract for resurfacing four roads on the main land with shells has been awarded to J. M. Griswold at 75 cents, $1.25, $1.75 and $2 a cu. yd.

San Francisco, Cal.—The contract for keeping the bitumenized streets in order for the next year was awarded Aug. 11 to the City Street Improvement company for $37,000.

Oswego, N. Y.—The Warren-Scharf Asphalt Paving company was awarded the contract Aug. 8 for paving W. Mohawk-st., between Fourth and Fifth-sts., with asphalt for $2,245.42.

Oakland, Cal.—The contract for improving San Leandro road has been awarded to E. B. Stone for $7,108, and for macadamizing Fruitvale-ave. to Gottlieb Schumacker for $8,000.

Fulton, N. Y.—(Special.)—O. C. Reed, cy. engr., says the contract for 800 sq. yds. of brick paving, curbing, etc., was awarded to A. S. Webb of Syracuse, N. Y., for $1,779.75.

Detroit, Mich.—James Grant was awarded a contract Aug. 3 for paving Congress-st., from Woodward-ave. to First-st., with brick at 87 cents a sq. yd. The city will furnish the brick.

Toronto, Can.—The Warren-Scharf Asphalt company secured the contract Aug. 4 for paving Spencer-ave. with asphalt for $9,790, and York-st., from Front to King, for $7,807.

Fremont, O.—Straub & Tischler of Mansfield, O., was awarded contracts Aug. 16 as follows: Paving Hayes-ave., Metropolitan block, $14,525.63; macadamizing W. Napoleon-st., $2,899.28.

Reading, Pa.—The Pennsylvania Asphalt company of Philadelphia was awarded a contract Aug. 19 for asphalt paving in this city at $1.74 a sq. yd. The city saved $14,000 by re-advertising the bids.

Indianapolis, Ind.—Contracts were awarded Aug. 22 as follows: Gravel and cement walks on Pawpaw-st., Geo. McCray, $1.74, and on Sterling-st., J. H. Roberts, $1.92; brick walks on Arizona-st., H. T. Nolting, 96 cents.

Milwaukee, Wis.—Contracts for putting in

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combination cement curbing and gutters were awarded, Aug. 16, to Stamsen & Blome at 39 cts. a ft., and cement sidewalks at 67 cts. a ft.

Kewanee, Ill.—The lowest bid submitted for paving Tremont-st. with brick on a 6-in. concrete foundation was that of the Flick & Johnson Construction Co. of Davenport, Ia., for $36,157.48.

Portland, Me.—The contract for paving the Portland bridge was awarded, Aug. 15, to the Maine & New Hampshire Granite Co. for $2.136. T. F. Griffin & Bro. will furnish the material for $3,888.

Laporte, Ind.—The contract for constructing about 9,000 sq. yds. of paving was awarded to Chas. L. Kinney of Elkhart, Ind., at $1.16 a sq. yd. Metropolitan repressed block will be used.

Lafayette, Ind.—The Indiana Construction Co. of Terre Haute, Ind., has been awarded the contract for constructing 6-ft. cement sidewalks in Columbia-st., from Sixth to Main, at 49 9-10 cts.

Cedar Falls, Wis.—The contract for brick paving was awarded, Aug. 2, to J. W. Campbell of Des Moines, Ia., at 84½ cts. a sq. yd. for Des Moines brick and 32 cts a lin. ft. for cement curbing.

Beaver Falls, Pa.—The contract for paving Eleventh-st. with vitrified brick was awarded, Aug. 2, to Funkhauser & Coates and C. I. Harrold, the contract being divided equally between the two firms; total cost, $9,388.16.

Rockford, Ill.—The contract for paving E. State-st. with asphalt was awarded, Aug. 1, to the Barber Asphalt Paving Company of Chicago at $1.73 a sq. yd. The Assyrian Asphalt company presented the lowest bid, $1.64.

Bridgeport, Conn.—The lowest bid received Aug. 3 for paving with asphalt Fairfield-ave. and Main-st. was that of the Atlantic Alcatraz company of New York City, which was as follows: 5 yrs. guarantee, $2.18; 10 yrs., $2.38; 15 yrs., $2.56.

Olean, N. Y.—B. U. Taylor & Co. were awarded the contract, Aug. 12, for 2,000 sq. yds. of brick paving at $1.29 a sq. yd.; 1,270 lin. ft. 4-inch curb, 35 cts.; reset curb, 15 cts.; 4-inch circular curb, 53 cts.; drain tile, 4 cts.; total, $3,235.

Buffalo, N. Y.—The Barber Asphalt Paving company submitted the lowest bid, Aug. 15, for surfacing Ferry-st. for $14,533; L. H. Gipp, for repaving Babcock-st. with brick, at $20,000, and Henry P. Burgard with asphalt at $23,000.

Rensselaer, N. Y.—The contract for paving the approaches to the viaduct was awarded to Frank Pidgeon of Saugerties at $3 a sq. yd. for granite paving, 50 cts. a sq. ft. for bridge and crosswalk stone and $1.25 a lin. ft. for circular curbing; total, $10,584.

Belleville, Ill.—The Meyers Construction company of St. Louis was the lowest bidder, Aug. 17 for paving E. Main-st. with brick, and will probably be awarded the contract. The company's bid was $16,125 for Wabash brick and $15,435 for Evansville brick.

Rockford, Ill.—The contracts for paving S. Main-st., from the Illinois Central tracks to Morgan-st., with asphalt and brick have been awarded to the Barbar Asphalt Paving ave. with asphalt at $1.98, and Fifth-st. at $2.24 a sq. yd. The Western Paving and Supply company secured the Newberry boulevard paving contract at $1.95.

Brooklyn, N. Y.—The lowest bid submitted for laying asphalt strips was that of T. U. Bowman, which was as follows: Asphalt, $1.95 and $1.80 a sq. yd.; concrete foundation, $4.20 a sq. yd.; block stone, 30 cts. a sq. yd.; wooden leaders, $16 per M ft.; total, $23,000.

Spokane, Wash.—The contract for paving Riverside-ave. with asphalt was awarded to the City Street Improvement company of San Francisco, Cal., at $2.38 a sq. yd. for Standard asphalt. The property-owners have asked, however, that work be suspended until April, 1899.

Rochester, N. Y.—The contract for paving E. Main-st., from Goodman-st. to the Culver road, was awarded Aug. 10 to Whitmore, Rauber & Vicinus for $56,173. Hornellsville brick will be used. The Warren-Scharf Asphalt company of New York City secured the contract for paving Clarissa-st. for $11,565.41.

Des Moines, Ia.—Contracts have been awarded as follows: Curbing Pleasant-st. and Kingman boulevard, T. O'Brien & Co., 39 9-10 and 39 9-10 cts. a lin. ft. respectively; paving number of alleys with brick, Likes Improvement company, $1.32 a sq. yd.; paving Pleasant-st. with brick, Jack Campbell.

Alexandria, Va.—Only two bids were submitted Aug. 11 for paving King-st., between Fairfax and Royal-sts., with vitrified brick. Julian C. Smith of Baltimore bid $2.19 and $2.25 a sq. yd. and Martin McManus of Washington $2.25. The bids are considered too high and action on them was deferred for a few days.

Brooklyn, N. Y.—Cranford & Co. submitted the lowest bid Aug. 2 for repairing and maintaining about fifty asphalt streets as follows: Maintaining and repairing asphalt over whole street, 13, 18 and 20 cts. a sq. yd.; new curbstone, 75 cts. a lin. ft.; new cross walks, 40 cts. a sq. ft.; restoring openings, $3 a sq. yd.

Anderson, Ind.—(Special.)—H. H. Rogers, cy, engr., says contracts for 14,000 sq. yds. of brick pavement, using Canton metropolitan block, were awarded to Charles L. Henry of this city at $1.17 a sq. yd., and for 4,000 sq. yds. to Charles H. Daniels at $1.22 a sq. yd. The foundation will be 10 ins. of gravel and 2 ins. of sand.

Indianapolis, Ind.—The Warren-Scharf Asphalt company was awarded the contract Aug. 9 for paving with asphalt the first alley east of Meridian-st., from Vermont to Michigan, at $2.08 a lin. ft. each side. The contract for creosoted wood block paving with stone curbing, on Twelfth-st., was awarded to the Hoosier Construction company at $4.33 a lin. ft.

Newark, N. J.—Asphalt paving contracts were awarded Aug. 25 as follows: Atlantic Alcatraz Asphalt company—Ninth-ave., $1.68; Broome-st. and Sidney-place, $1.65. New Jersey Asphalt company—N. Seventh, Fulton and S. Seventh-sts., $1.64; a second part of N. Seventh will be paved with brick at $1.75. Barber Asphalt Paving company—Lincoln Park, $1.58.

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Thirty-fourth-st., Grant Paving company, $1.37; curbing the same district, J. B. Smith, 53 cts. for asphaltum sandstone, and 55 cts. for Colorado sandstone.

Kansas City, Mo.—The Barber Asphalt Paving company has been awarded contracts amounting to $57,910. Other paving contracts awarded are: Garfield-ave., asphalt, Gilsonite Paving company, $2.10; Central-st., brick, $1.44⅝, and Washington, $1.48, Matt Kinlen; Holly-st., brick, Parker-Washington company, $1.49; alley, A. P. Morse, $1.53, alley, Walter Hickman, $1.59.

Syracuse, N. Y.—Paving contracts were awarded the latter part of July as follows: Park-ave., from Northwest-st. to Barker-ave., Trinidad asphalt, Columbia Construction company, $9,256.60; Barker and Matty-aves. and Wilkinson and Tracy-sts., Asphaltina, Asphaltina Construction company, $21,676.80; Park-ave., from Barker-ave. to Geddes-st., Alcatraz asphalt, Empire Contracting company, $40,628.90.

New Orleans, La.—Bids were received Aug. 8 for paving with asphalt Canal, Claiborne and Camp-sts. The Ayres Asphalt company of Zanesville, O., was the lowest bidder on Camp-st., at $2.52 a sq. yd.; the French Asphalt company on Claiborne-st., at $2.43 a sq. yd.; Belden & Seely, representing the Columbia Construction company, on Canal-st., at $2.65 on 6-in. concrete, $2.49 on 4-in. concrete, and $2.28 on square block.

Toledo, O.—The contract for macadamizing Bancroft-st. was awarded Aug. 18 to Contractor Ryan for $5,844.20. The contract for the work was awarded some time ago to G. H. Bodette, but he refused to keep the macadam road in repair for five years. Schillinger Bros. submitted the lowest bid Aug. 20 for constructing 19,000 ft. of asphalt walk around the court house park at $1.15 a lin. ft.

Meadville, Pa.—Peter Schenck of Butler, Pa., was awarded the contract for paving with Park fire clay brick, wire-cut and Meadville sandstone, as follows: Paving, $1.25 a sq. yd.; flagging, natural or sandstone and curbing, 40 cts. a ft.; edge stone, 33 and 25 cts.; cast iron gutter plates, 1¾ cts. a lb.; two standard catch basins, $30 each; 12-in. storm sewer, 40 cts. a ft.; 10-in. sewer, 35 cts. each; total, $4,958.

Peoria, Ill.—The contract for paving Dechman-ave. with asphalt was awarded Aug. 15 to the Assyrian Asphalt company of Chicago at the following prices: Asphalt, $1.54 a sq. yd.; excavation, 15 cts.; setting protection curb, 25 cts.; combination curb and gutter, 52 cts. The Warren-Scharf Asphalt company bid $1.79. The contract for grading 85 rods of the Galena road was awarded Aug. 16 to the Crescent Stone company at $7.39 a lin. rod.

Cincinnati, O.—The Southwestern Alcatraz Asphalt Paving and Construction company was awarded the contract Aug. 4 for paving Bates-ave., from Colerain to Spring Grove-ave., 2,735 sq. yds., with Alcatraz asphalt, at $1.67 a sq. yd.; curb, 88 cts. a lin. ft.; re-setting curbs, 5 cts.; grading, 25 cts. a cu. yd.; repaving 50 cts. a sq. yd.; total, $7,791. M. T. Flynn secured the contract Aug. 2 for improving Western-ave. for $14,386.

Newark, N. J.—Asphalt paving contracts were awarded Aug. 4 to the Newark Paving & Construction company as follows: Elm-st., $1.51; Livingston-st., $1.55; Charlton-st., $1.57 a sq. yd. The Atlantic Alcatraz company was the lowest bidder on Garside-st., at $1.65 a sq. yd,, but the awarding of the contract was deferred to enable Engineer Adam to ascertain whether the company had conformed to the specifications in submitting samples of material. The contract for paving Pacific-st. with granite was awarded to James F. Shanley at $1.54 a sq. yd.

Brooklyn, N. Y.—Bids were received Aug. 16 for laying asphalt strips from Thirty-fourth-st and Astoria ferries in Long Island City, to connect with the good roads in Queens Landing out on Long Island, as follows: The Warren-Scharf company bid $1.85 and $1.80 a sq. yd. for asphalt; concrete foundation, $4.50 and $4.25; stone block foundation, 38 and 35 cts. a sq. yd.; wooden leaders, 1,000 ft., $22. Barber Asphalt Paving company—Asphalt, $1.78 and $1.84; concrete, $4.50; stone block, 35 cts., and wooden leaders, $22. Atlantic Alcatraz Asphalt company—Asphalt, $1.96 and $1.98; concrete, $4.44; stone block, 38 cts., and wooden leaders, $22. T. U. Bowman—Asphalt, $1.95 and $1.80; concrete, $4.20; stone block, 30 cts., and wooden leaders, $16.

SEWERS.

Riverside, Cal.—The city engineer has compiled a book of sewers and sewer connections, which shows that the city has more than 9½ mls. of sanitary sewer, which have cost $42,009.70. The first sewer was laid in 1887.

Cohoes, N. Y.—The public improvement commission engaged Prof. Palmer C. Ricketts of Troy, N. Y., to consider the plans for a sewerage system, for which bids were received in July. He recommends the plan signed I. X. L., for by it most of the present sewers can be used.

Toronto, Ont.—Dr. Sheard, medical health officer, visited the United States recently to obtain information on sewage disposal. He was most favorably disposed with the methods in use in Worcester and Brockton, Mass. In Worcester the sewage is treated by precipitation, and in Brockton by filtration.

A delegation of the city government of Montreal, Canada, consisting of Alderman D. Gallery, A. Eckers, R. Turner, P. G. Martineau, H. Dupins, E. Preneveau, Pierre Wilson, Leon Ounnet, city surveyor; P. C. St. John, and A. Bassette, secretary of the road department, have been examining sewerage systems in the United States.

Rochester, N. Y.—The common council has appointed Gaylord Thompson, M. Am. Soc. C. E., as expert engineer to assist the city assessors in the preparation of the assessment for the East Side trunk sewer, which was designed by Emil Kuichling, M. Am. Soc. C. E., about ten years ago. The sewer was built by aspecial commission created for that purpose, and cost nearly $1,000,000. This amount, with a cumulated interest, has now to be assessed upon the territory benefited.

Sewers—Contracts to Be Let.

Billings, Mont.—Bids will be received until Sept. 6 for constructing a sewerage system. Cy. clk.

Trenton, N. J.—Bids are asked until Sept. 6 for constructing sewers. C. E. Murphy, cy. clk.

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Santa Ana, Cal.—Bids will be received until Sept. 15 for constructing the outfall sewer. Bd. trustees.

Dunkirk, N. Y.—Bids are asked until Sept. 6 for building a tile sewer. Wm. C. Baumgarten, cy. clk.

Mansfield, O.—Bids will be received until Sept. 17 for building a storm water sewer. F. M. Remy, cy. clk.

Willmar, Minn.—Bids will be received until Sept. 10 for constructing ditch No. 8. Lewis Johnson, co. audt.

Le Sueur, Minn.—Bids will be received until Sept. 10 for constructing ditch No. 12. Jos. Rachac, co. audt.

Henderson, Ky.—Bids will be received until Sept. 6 for building a sewer or culvert. W. I. Thompson, mayor.

Pocomoke City, Md.—Bids are asked until Sept. 7 for constructing a sewerage system. R. M. Stevenson, mayor.

Lafayette, Ind.—Bids are asked until Sept. 12 for street improvements and sewers. Thos. W. Burt, cy. clk.

Richmond, Ind.—Bids will be received until Sept. 2 for building a storm water sewer. Jos. H. Winder, cy. clk.

Cleveland, O.—Bids are asked until Sept. 8 and Sept. 15 for constructing sewers. Geo. R. Warden, dir. pub. wks.

Richmond, Ind.—Bids will be received until Sept. 16 for the construction of a trunk sewer. J. H. Winder, clk. B. P. I.

Tiffin, O.—Bids are wanted until Sept. 5 for changing the main sewer in the Fourth ward. J. B. Ehrenfried, cy. clk.

Kearney, N. J.—Bids are asked until Sept. 13 for constructing 5,200 lin. ft. of brick sewer. Jas. F. Kelly, twp. clk.

Fairbault, Minn.—Bids will be received until Sept. 12 for constructing sewers, with manholes, etc. P. F. Ruge, mayor.

Racine, Wis.—Bids are asked until Sept. 3 for 2,100 ft. of brick and 3,000 ft. of pipe sewer. O. Burlingame, cy. engr.

Shelby, O.—Bids are asked until Sept. 19 for constructing about 6 miles of lateral sewers. W. F. Sonnantine, clk, sewer com'n.

Davenport, Ia.—Bids will be received until Sept. 7 for building a sewer on Le Claire-st. E. W. Boynton, comr. pub. wks.

South Bend, Ind.—Sealed proposals will be received until Sept. 12 for constructing a pipe sewer on N. Michigan-st. L. A. Hill, cy. clk.

Mansfield, O.—Sealed proposals will be received until Sept. 10 for constructing a 10-in. lateral sewer on Marion and Wise-aves. F. M. Remy, cy. clk.

Columbus, O.—Sealed proposals will be received until Sept. 6 for building sewers in sub-sewer dist. I of main sewer dist. 1. Jas. A. Fanning, clk. B. P. W.

Buffalo, N. Y.—Sealed proposals will be received until Sept. 2 for building brick sewers in Hampshire and Ferry-sts. and a tile sewer in Kenmore-ave. R. G. Parsons.

Callender, Ia.—Sealed proposals will be received until Sept. 5 for constructing sewers. Also, for furnishing No. 1 sewer drain tile. N. C. Rasmussen, chrmn. sewer com.

Waukesha, Wis.—Sealed proposals will be received until Sept. 2 for constructing a pipe sewer in Hartwell-ave., from Broadway to College-ave., 1,698 feet. John P. Dey, prest. B. P. W.

Boston, Mass.—Bids are asked until Sept. 8 for furnishing pumping engines, etc., for an addition to the sewage pumping plant at North Somerville. Wm. M. Brown, jr., ch. engr. Met. Sewerage Com'n.

Havana, Ill.—Sealed proposals will be received until Sept. 3 for constructing a submerged cast iron pipe, intercepting chamber with manhole, 320 ft. 4-ft. brick sewer and 3 catch-basins. H. C. Breidert, cy. engr.

Hammond, Ind.—Sealed proposals will be received until Sept. 8 for constructing a main brick sewer in the village of West Hammond, consisting of the following: 860 ft. 2-ring 3½ ft. sewer; 1,290 ft. 2-ring 4-ft. sewer; 250 ft. 3-ring 4-ft. sewer, with manholes, catchbasins and appurtenances. Martin H. Finneran, vil. clk.

CONTRACTS AWARDED.

McKee's Rocks, Pa.—E. F. Hughes was awarded sewer contracts Aug. 16 for $5,000.

Reading, Pa.—Frank P. Hawman secured the contract for a storm water sewer for $9,492.68.

Bayonne, N. J.—Martin Murray secured the contract for constructing a new sewer for $17,200.

Bellevue, Pa.—The contract for building the sewerage system was awarded to Harvey Sloan for $58,000.

Springfield, Mass.—The contract for sewer was awarded to Clapp & Shipman of New York for $25,625.

Anaconda, Mont.—The contract for building sewers in dists. 7, 8, 10 and 11 have been awarded to Patrick Walsh for $4,636.

Manitowoc, Wis.—The contract for building 300 feet of brick sewer has been awarded to Arnold Van Gemert for $1,500.

Decatur, Ill.—A. F. Gebhart secured the contract for constructing a lateral sewer at 30½ cts. a lin. ft.

Aurora, Ind.—The contract for constructing a sewer in Second-st. was awarded Aug. 3 to Richard Block for $3,247.

Alton, Ill.—The contract for the extension of the Front-st. sewer was awarded Aug. 22 to Chas. Dagenhart at $2.75 a lin. yd.

Syracuse, N. Y.—The contract for building a trunk sewer in Midland-ave. has been awarded to John W. Bustin for $50,000.

Milwaukee, Wis.—The contract for building the Thirtieth-st. tunnel sewer was awarded to Geo. E. Zimmerman for $24,993.50.

Annapolis, Md.—The contract for building a sewer in West and Calvert-st. was awarded Aug 8 to D. V. Bright for $2,224.22.

Rockford, Ill.—The contract for building 1,360 feet of 9-in. sewer was awarded Aug. 20 to Thos. Tole at 29½ cts. a ft.

Bridgeport, Conn.—The contract for constructing a sewer in Harral-ave. was awarded Aug. 19 to the Pierce Manufacturing company at $1.79 a lin. ft.

Kansas City, Mo.—The contract for building brick and pipe sewers in district No. 175 was awarded, Aug. 11, to M. Walsh for $13,800.

Highland Park, Mich.—The contract for building sewers, the outlet to be into the Detroit system, has been awarded to James Hanley, of Detroit, for $51,850.

Reading, Pa.—The board of public works has recommended that the contract for building the house sewer in the ninth district be awarded to Samuel W. Frescoln for $41,878.

Boston, Mass.—Bids were received Aug.

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18 for building brick and pipe surface drains in Dorchester as follows: T. H. Connolly, $8,531; J. P. O'Connell, $10,501; Collins & Ham, $11,358; T. H. & G. W. Byrne, $12,117; J. J. Falvey, $12,317; D. E. Lynch, $12,933; Jones & Meehan, $13,570; H. P. Nawn, $14,457.

Mendota, Ill.—Bids were received Aug. 15 for constructing the sewer outlet as follows: Sewer extension—Israel Doan, $3,991; N. E. Stucker, $2,547. Filtration bed—Law & Barber, city, $15,797; Israel Doan, Aurora, $15,501; H. D. Hallett, Mattoon, $15,012; J. H. Roach, $14,559; P. H. Mahoney, Omaha, $11,066; Berry & Welsh, $8,486. The contract has not been awarded. Charles P. Chase of the Iowa Engineering company will superintend the work.

Kewanee, Ill.—The contract for the extension of the northwest sewer was awarded, Aug. 23, to Mason, Lindburg & Skoog, city, for $734.30. The contract for the sewage disposal tanks was let as follows: Substructure, laying pipe, excavating, filling and one distributing main, Stamsen & Blome, Chicago, $985.40; superstructure, John McCullough, city, $418; gasoline engine, boiler and 6-inch centrifugal pump, H. A. Dustin, city, $766.79.

CONTEMPLATED WORK.

Bessemer, Col.—Plans for a sewerage system have been adopted.

Pittsburg, Pa.—Sewers will be constructed in several streets.

Denton, Tex.—Action is being taken toward securing a sewerage system.

Taunton, Mass.—An appropriation of $16,000 has been voted for sewers.

Ripley, O.—The question of building a sewerage system is being agitated.

Philadelphia, Pa.—The 3-ft. brick sewer in Chestnut-st. will be enlarged.

Springfield, Mass.—The construction of a sewer in Worthington-st. is contemplated.

Elkhart, Ind.—The city council has decided to construct a sewer in Middlebury-st.

Oswego, N. Y.—Plans will probably be prepared for a sewer in E. Bridge-st. Cy. engr.

Everett, Mass.—The council has appropriated $10,000 for a sewer in Hendersonville.

Kokomo, Ind.—The construction of a 4-ft. brick sewer in Union-st. is contemplated.

St. Louis, Mo.—The wooden bottom of the Mill Creek sewer will be replaced with concrete.

Oakmont, Pa.—This borough voted Aug. 16 to issue bonds to construct a sewerage system.

New Britain, Conn.—The question of sewage disposal is being considered. M. O. Webster, mayor.

Jackson, Mich.—The construction of a sewer in Union-st. in the near future is contemplated.

Quincy, Ill.—Ordinances were adopted by the city council Aug. 17 for constructing six sewers.

Woodbridge, N. J.—The question of building sewers in four streets will be voted on Sept. 20.

Carlisle, Pa.—The construction of a brick sewer is contemplated at a cost of $8,000. St. Com.

Sheraden, Pa.—The citizens voted Aug. 15 to issue $30,000 for paving and sewer construction.

Rockford, Ill.—About 5,000 ft. of pipe sewer have been ordered constructed. Edwin Main, cy. engr.

Philipsburg, N. J.—About 1¼ miles of sewer extensions are contemplated. James E. Smith, cy. engr.

Owosso, Mich.—A mile of 24 to 8-in. pipe sewer will be constructed; estimated cost, $5,500.

Little Falls, N. Y.—Sewers will be constructed in three streets at a cost of $20,000. Mayor Dasey.

Cloquet, Minn.—The construction of a sewer in Arch-st., from B to C-aves., is proposed.

Madison, Wis.—The city engineer's plans for a storm water sewer in N. Hamilton-st., have been filed.

Montclair, N. J.—The council acted favorably upon a petition for a sewer in Fulton-st. Aug. 22.

Mansfield, Pa.—The construction of 15 to 10-in. pipe sewers for the proposed system is contemplated.

Richmond, Va.—Bids will probably be asked about the middle of September for constructing certain sewers.

Sherman, Tex.—The question of sewerage construction will be considered the first Monday in September.

Belvidere, Ill.—An ordinance was passed Aug. 15 providing for the construction of a branch sewer in N. State-st.

Philadelphia, Pa.—The citizens in the Seventeenth, Eighteenth and Twentieth wards are agitating the question of building sewers.

Oakland, Cal.—City Engineer Clements has been instructed to prepare plans for extensive sewer improvements.

East Hartford, Conn.—Sewers will probably be constructed in the East Hartford and Meadow districts. J. O. Goodwin, town clk.

Hamilton, O.—Plans and specifications for a sewer in Market-st. are being made by Civil Engineer Marble of Columbus, O.

Columbia, Mo.—The report of the sewer commission contemplates 5 1-6 miles of sewers at a cost, complete, of $25,000.

Hempstead, L. I.—The question of constructing a sewerage system is being considered. Henry L. Nichols, vil. prest.

Altoona, Pa.—Ordinances have been passed for constructing sewers in Second-ave. and Fifth-st., and in three alleys.

Cincinnati, O.—The contract for sewers in Camp Washington will be let in about three months. I. B. Punshon, cy. engr.

Waycross, Ga.—Surveys for the construction of a sewerage system are being made by W. H. Chapman, C. E., of New York City.

Everett, Mass.—An appropriation of $10,000 for constructing trunk sewers and connections in Hendersonville is reported.

Findlay, O.—A resolution has been passed to construct a sewer in Frazier-st., from Morey-ave. to Cory-st. A. W. Ray, cy. clk.

Newark, N. J.—Plans for the Clinton Hill sewer were submitted to the board of works by Engineer Adam Aug. 4 and accepted.

Niles, O.—A resolution has been passed declaring it necessary to build a sewer on Robbins-ave., from Summit-ave. to Mosquito creek.

East Hartford, Conn.—The question of building sewers in the business portion of the city is being considered by the Meadow Fire district.

Hazleton, Pa.—The city engineer has been authorized to receive proposals for the con-

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struction of ten trapped inlets with catch-basins, etc.

Gettysburg, Pa.—The sewerage system is in need of repairs, and probably a new system will be constructed. J. L. Kendlehart, secy. town com.

Laurium, Mich.—Plans for a sewerage system are being prepared and bids will probably be asked in December or January. Jos. R. Murphy, vil. clk.

Granite City, Mo.—Engineers have been employed to make surveys for the proposed chain of sewers connecting this city, Newport, Madison and Venice.

South Norwalk, Conn.—A 24-in. overflow storm sewer will be constructed to relieve the sewers in the lower portion of the city. Jos. R. Taylor, cy. clk.

Newark, N. J.—Ordinances have been ordered to third reading for the construction of sewers in about 30 streets. Wm. E. Greathead, clk. bd. st. & water comrs.

Princeton, Ill.—The sewerage plans prepared by Alvord & Shields of Chicago have been accepted; estimated cost, $70,000. A. E. Vaughn, cy. clk.

Sycamore, Ill.—This city has decided upon the separate system. Alvord & Shields, Chicago, will prepare plans and superintend the construction of the main outlet.

Bushnell, Ill.—Aldermen Wierather, Wheeler and Throckmorten have been appointed a committee to make the preliminary arrangements for constructing a sewerage system.

Jackson, La.—Maps and estimates of a sewerage system have been prepared by W. G. Kirkpatrick of Nashville, Tenn., and the question will soon be submitted to vote.

Rat Portage, Ont.—C. W. Belyea, R. E. Dowsett and the mayor have been appointed a committee to investigate the feasibility of constructing a sewerage system.

Brookfield, Mo.—(Special.)—D. T. Howard, cy. clk., says that the proposition of issuing $14,000 of 6 per cent. bonds for the construction of a main sewer will be voted on Sept. 5.

Denver, Col.—Plans and estimates for about 2,000 acres of storm sewerage are being prepared, according to report, the plans to be completed during September. H. C. Lowrie, engr. B. P. W.

Mobile, Ala.—The general council met Aug. 23 to consider sewerage plans, but the commission asked for ten days' further time to consider and submit estimates of the cost of construction.

Independence, Mo.—Plans and estimates for a sewerage system were submitted by Andrew Rosewater, C. E., of Omaha, Neb., Aug. 13. An election will probably be called to vote on issuing bonds.

Elmhurst, Ill.—(Special.)—A sewer, 12 in. in diameter, 640 ft. long, with manholes and Backus-st. and Elm road, Gotthart, Garrison, Houston, Napoleon and other streets and avenues. Michael F. McLaughlin, genl. supt. wks.

WATER-WORKS.

Dubuque, Ia.—Notice has been served on the water company of the city's intention to purchase the plant.

Duluth, Minn.—The plant of the Duluth Gas and Water company was transferred, July 31, to the city of Duluth.

Lancaster, Pa.—A chemical analysis of the city water develops the fact that typhoid fever germs exist in it. The introduction of a filter and aeration pump is suggested.

Auburn, Me.—The water commissioners appointed a committee recently, consisting of E. S. Paul, A. M. Pulsifer and R. M. Mason, to investigate and report regarding the matter of keeping the water pure in Lake Auburn.

Sedalia, Mo.—The Sedalia Water and Light company, sold, Aug. 13, to R. C. Warren of New Haven, Conn., E. Burr, jr., and H. M. Knapp of Bridgeport, Conn., L. P. Andrews, Geo. E. Dugan, Chas. C. Evans and O. A. Crandall of Sedalia, the water works, for $400,000.

Redlands, Cal.—The Redlands Water company has appointed a committee consisting of Dr. M. M. Hooten, Dr. Smith, Prof. T. E. N. Eaton, C. E. Lienau and Harry Clark, to investigate the proposition made by the Mentone Irrigation company to sell them tunnel water rights and right of way to this city.

An order, directing the authorities of the city of New York to show cause why it should not be enjoined from drawing off the fresh water streams which flow into Bellmore, Freeport, Millburn, Seaford and East Rockaway creeks, in the town of Hempstead, was granted by Supreme Court Justice Smith, Aug. 1. The order was made returnable Aug. 9.

Columbus, O.—The report on the proposed storage dam and reservoir for the water works system has been submitted by Jas Schuyler, M. Am. Soc. C. E., of Los Angeles, Cal. He recommends that the concrete dam be 52 ft. high and that a spillway be provided. Also, that the curvature of the dam be increased by diminishing the radius from 1,910 to 800 ft. or less.

Buffalo, N. Y.—The reduction of the water rates is alleged to have caused a shortage in the water department of about $65,000. Under the estimates submitted by the Bureau of Water for the last fiscal year, the city was called upon to appropriate $700,000. This estimate was based on the calculation of the superintendent of water that the receipts

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McComb City, Pa.—Bids are asked until Sept. 21 for constructing water works. Mayor.

Bristol, Va.—Bids are asked until Sept. 21 for water works. J. D. Mitchell, chrmn. com.

Maynard, Minn.—Bids are asked until Sept. 5 for building water works. K. H. Holian, vil. rec.

Tyndall, S. D.—Bids will be received until Sept. 6 for laying water mains. James Sharon, co. audt.

Cumberland, Md.—Bids are asked until Sept. 5 for 5,500 ft. of pipe, valves, etc. H. M. Fuller, clk.

Lanesboro, Minn.—Bids will be received until Sept. 5 for building a water works system. O. M. Habberstad, vil. clk.

Pocomoke City, Md.—Bids will be received until Sept. 7 for constructing a water works system. R. M. Stevenson, mayor.

Anaconda, Mont.—Bids will be received until Sept. 5 for furnishing water for this city for five years. T. O'Leary, cy. clk.

Walker, Minn.—Sealed proposals will be received until Sept. 6 for building a water works system. Charles Kinkele, prest. vil. com.

Reedsburg, Wis.—Bids will be received until Sept. 2 for furnishing an 80 h. p. single cylinder Corliss engine, line shafting, belt, etc. Cy. clk.

Columbus, O.—Bids are wanted until Sept. 10 for the foundation and lower portion of the concrete masonry dam. James A. Fanning, clk. B. P. W.

Winnipeg, Man.—Bids invited until Sept. 6 for wells and pumping plant will not be opened owing to arrangements not being completed. C. W. Brown, cy. clk.

CONTEMPLATED WORK.

Farmington, Utah.—Plans are being prepared for water works. E. A. Vail.

Whittier, Cal.—The question of a better water supply is being considered by the city council.

Atlanta, Ga.—The question of issuing $200,000 extension bonds will be voted on Oct. 5.

Buffalo, N. Y.—The citizens of Kenmore have asked this city to supply them with water.

Fulton, Ill.—The city council contemplates building another reservoir near the artesian well.

Lebanon, Pa.—Ordinances have been passed for the extension of water mains. George W. Hayes, cy. engr.

Charlotte, N. Y.—Plans are being prepared for a water works and electric light plant. P. M. Schwartz, cy. clk.

Niagara Falls, N. Y.—An extension of 7,700 ft. of 12 and 10-in. mains is contemplated. Walter Jones, cy. engr.

Philadelphia, Pa.—Bids will be received for the West Philadelphia reservoir, by Director Thompson.

Sardis, Miss.—Plans are being prepared by Alber & Byrne of Birmingham, Ala., for the construction of water works.

Wamega, Kas.—Plans and specifications will be prepared for the proposed water works by H. V. Hinckley of Topeka, Kas.

Florence, Colo.—Hiram Phillips, C. E., St. Louis, Mo., has been engaged to prepare plans for the water works.

Centralia, Ill.—The city council is considering some plan for providing for a permanent and reliable water supply.

Medford, Ore.—A committee has been appointed to consider the matter of building a reservoir and enlarging the water works.

Clarksville, Ind.—The aldermen are reported as making arrangements for putting in a filtration plant and to improve the works.

McDonald, Pa.—The McDonald Water company has plans for the construction of a large reservoir to supply this borough with 2,000,000 gals. of water daily.

Monmouth, Ill.—The city council instructed the water works committee, Aug. 9, to purchase land for the purpose of re-locating the water works plant.

Baltimore, Md.—The council committee on health has adopted an ordinance providing for the establishment of a filtration plant for the Lake Roland supply.

Alton, Ill.—A proposition has been submitted to the council by the Seckner Contracting company to furnish plans and specifications for works and for the construction of the same.

Sausalito, Cal.—The scarcity of the water supply has led to the employment of N. M. O'Shaughnessy, C. E., of San Francisco to report on the best method for furnishing an adequate supply.

Rome, Ga.—This city contemplates constructing the clarifying system with its own men. The plans provide for a system of settling basins, with or without a gravity or sand filter. H. M. Smith, cy. engr.

Mt. Gilead, O.—A detailed report of the estimated cost of building a combined water works and electric system has been received from B. J. Ashley of Chicago, who places the cost at $26,800.

The question of issuing bonds for constructing water works will be voted as follows: Shawnee, Okla., McConnellsville, O.; Sept. 19; Gallatin, Tenn., Sept. 24; Arlington, Ga.; Tehamah, Neb.; New Richmond, O., Sept. 6.

The question of constructing water works is being agitated at the following places: Shawnee, Okla.; Berea, O.; Copenhagen, N. Y.; Coalville, Utah; Girard, O.; Mt. Sterling, Ky.; Hammonton, N. J.; Beloit, Wis.; Luray, Va.; Manti, Utah; Atwood, Ont.

St. Joseph, Mo.—This city is ready to contract for the construction of the proposed new works. They will include two low-service pumps, 8,000,000 gals. each; three high-pressure pumps, 5, 8 and 10,000,000 gals. each; standpipe, three settling basins, filter, etc. J. R. Rackliffe, cy. engr.

Fulton, N. Y.—(Special.)—O. C. Breed, cy. engr., says the proposed construction of a new system of water works has been postponed for the present owing to the water commission having agreed to arbitrate, subject to the approval of the taxpayers, for the acquisition of the present system.

The construction of water works systems is contemplated at the following places: Richfield, Utah; Whitesboro, N. Y.; Wichita Falls, Tex.; Kewanee, Ind.; Columbus, Pa.; Moultrie, Ga.; Greenup, Ill.; Clare, Ia.; Dickson, Tenn.; Fossil, Ore.; Highbridge, N. J.; Flemington, N. J.; Whittiers, Cal.; Stent, Cal.

The question of constructing water works has been favorably voted on as follows: Eaton Rapids, Mich.; Lake Odessa, Mich.; Earling, Ia.; Galesville, Wis.; Otsego, Ia.; Wasco, Ore.; Arkansas City, Kas.; Kirkville, Mo.; Perham, Minn.; Webster Groves, Mo.;

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Prescott, Ont.; Harrisville, Pa.; Greensboro, Ga.; Walnut Grove, Minn.

CONTRACTS AWARDED.

Caldwell, N. J.—The Caldwell Water company has asked the borough council for a franchise to establish works.

Flagstaff, Ariz.—The contract for constructing the water works system has been awarded to George Sturtevant, jr., for $85,000.

Cattaraugus, N. Y.—The contract for extending the water works system was awarded to W. B. Wilson of Buffalo for $7,000.

Derfield, N. Y.—The town board has accepted a proposition of the West Canada Creek Water company to supply water for this place.

East Chicago, Ind.—The Seckner Contracting company, Chicago, secured the contract for extending the water works for $36,960.

Oxford Junction, Ia.—The contract for constructing water works was awarded Aug. 4 to Otto P. Hanson of this city for $3,750.

Salem, N. J.—The contract for building a filtration plant of 500,000 gals. was awarded to Joseph H. and C. J. Young of Philadelphia.

Bessemer, Ala.—The contract for increasing the water supply, enlarging the reservoirs, etc., was let to Henry F. De Bardeleben for $5,000.

Churubusco, Ind.—The contract for building the water works and electric light plant was awarded to the Seckner Contracting company of Chicago for $18,500.

New Paynesville, Minn.—The contract for building an electric light and water works plant was awarded to W. I. Gray & Co. of Minneapolis for $8,306.

Elberton, Ga.—An election has been called for Sept. 20 to determine whether or not this city shall enter into a contract with George J. Baldwin for the erection of a water works system.

Kaukauna, Wis.—The contract for building the water works system for the Kaukauna Water Works company was awarded to C. W. Weeks & Co. of Chicago and Luther Lindauer, Kaukauna, for $75,000.

Albany, N. Y.—The contract for building the pumping station at the filtration plant was awarded to Stone & Thurston of New York City at the following prices: Cast iron intake, $3,800; pumping station, $12,167; chimney stack, $1,540; sluice gates and screens, $825; 600 cu. yds., shallow exc. 50 cts.; 700 cu. yds. concrete, (1-3-6), $4.95; 100 cu. yds. concrete, (1-2-4), $6; 100 sq. yds. paving, $1; total, $22,977.

Jersey City, N. J.—Only one bid was received Aug. 18 for furnishing the new water supply, and that was from Patrick H. Flynn of Brooklyn. His bid was based on three plans: 1—Source of supply, Rockaway river, at Old Bloonton with one reservoir, from $36 per million for 25,000,000 gals. per day to $20 per million gals. for 70,000,000 gals. daily; completed works, $7,595,000 for 50,000,000 gal.

STREET LIGHTING.

Oakland, Md.—A municipal electric light plant is contemplated.

Lansdowne, Pa.—Bids are asked until Sept. 2 for street lighting.

Springville, Ia.—Arrangements are being made to establish an electric light plant.

Tallahassee, Fla.—The establishment of an electric light plant is contemplated.

Lonerock, Wis.—The question of establishing an electric light plant is being discussed.

Delaware, O.—Bids are asked until Sept. 3 for lighting with electricity or gas. E. E. Naylor, cy. clk.

New Richmond, O.—The question of issuing bonds for an electric light plant will be voted on Sept. 5.

Chicago, Ill.—Plans are being prepared by the city engineer for electric lights in the new pumping stations.

Anaconda, Mont.—Bids are asked until Sept. 5 for furnishing arc lights for street lighting. T. O'Leary, cy. clk.

Watertown, N. Y.—The question of municipal lighting is being investigated. C. C. McComb, cy engr.

Havelock, Neb.—Plans are being considered for an electric light plant, according to press reports.

Fredericksburg, Va.—The city council is considering the question of erecting a municipal electric light plant.

Evansville, Ind.—Mayor Aiken has, according to press reports, agreed to levy a tax for a municipal electric light plant.

Trappe, Md.—The construction of an electric light plant is contemplated. S. Chaplain, prest. bd. town comrs.

Decatur, Mich.—Sealed proposals will be received until Sept. 6 for constructing an electric light plant. E. J. Rawson, clk.

Chicago, Ill.—The Jefferson Electric Light Co. has been incorporated by M. A. Fort, Harry Ferguson and Wm. M. Copeland.

Winchester, Va.—Bids will be received until Sept. 15 for constructing an electric light plant. Henry Schneider, chrm. light com.

BRIDGES.

Armour, S. D.—Bids will be received until Sept. 5 for building a bridge. Co. aud.

Elberton, Ga.—The county commissioners contemplate building bridges across Broad river.

Unionville, Mo.—Bids are asked until Sept. 6 for three bridges. Chas. E. Bailey, br. comr.

Paterson, N. J.—Plans will be prepared for constructing a new bridge at Main-st. Bd. freeholders.

Oshkosh, Wis.—Bids are asked until Sept. 6 for constructing a bridge across Sawyer creek. B. P. W.

Oroville, Cal.—Bids are asked until Sept. 7 for building a bridge over Powell creek. Bd. supervisors.

Rose, N. Y.—This town has decided to build a new iron bridge over the Adams canal at Glenmark.

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Pendleton, Ore.—Bids will be received until Sept. 7 for building two bridges. B. G. Burroughs, cy. clk.

Newport News, Va.—Bids are asked until Sept. 16 for bridges across C. & O. R. R. J. A. Massie, cy. clk.

Colusa, Cal.—Bids are asked until Sept. 6 for building a bridge on Princeton rd. Geo. K. Ford, clk. bd.

Brainerd, Minn.—Sealed bids will be received until Sept. 9 for building a steel bridge. F. A. Farrar, cy. clk.

Minneapolis, Minn.—The erection of an iron bridge across Straight river is contemplated by the council.

Natchitoches, La.—Bids will be received until Sept. 15 for an iron bridge over Johnson Chute. Geo. W. Kile.

Lorain, O.—Plans and specifications will be prepared for a new bridge at Erie-ave. by F. C. Osborn, C. E. of Cleveland.

Columbus, O.—Bids will be received until Sept. 13 for repairing and rebuilding a bridge. W. H. Halliday, co. audt.

Westfield, Mass.—The construction of an iron or steel bridge over Little river has been decided upon. Co. comrs.

Lima, O.—Bids will be opened Sept. 12 for building a bridge over the Ottawa river in Sugar creek twp. Co. comrs.

Jefferson City, Mo.—The county court is considering a petition for the construction of a bridge across the Moniteau river.

Accotink, Va.—Bids are asked until Sept. 5 for constructing an iron bridge over Accotink river. A. B. Lukens, chrm. com.

San Jose, Cal.—Bids will be received until Sept. 6 for building a bridge over Stevens creek. Geo. E. Rea, chrm. bd. suprs.

Westfield, Mass.—The county commissioners have ordered the town to build a new iron or steel bridge over Little river.

Chicago, Ill.—Plans are being drawn for three new bridges over the north branch of the Chicago river. Cy. Engr. Erickson.

Aitken, Minn.—The Wrought Iron Bridge company, Canton, O., was awarded the contract for rebuilding the Knox street bridge for $1,993.

Freeport, Ill.—The Wrought Iron Bridge company, Canton, O., was awarded the contract for building two bridges in Harlem twp. for $700.

Trenton, Mo.—Bids will be received for reconstructing and constructing wood or iron bridges. P. S. Vannatta, deputy br. comr.

Chicago, Ill.—Sealed proposals will be received until Oct. 5 for erecting certain bridge substructures. James Reddick, clk. bd. trustees.

Des Moines, Ia.—The city council has been petitioned to construct a bridge over the Des Moines river, from E. Sixth-st. to the south side.

Wausau, Wis.—Sealed proposals will be received until Sept. 5 for building a steel bridge across the Wisconsin river. Frank Ross, chrmn.

Pelham, N. Y.—The town board is considering the feasibility of building three new bridges over the Hutchison river, between this town and Mt. Vernon.

Elberton, Ga.—The county commissioners have decided to build a bridge over Broad river, between Elbert and Wilkes counties. J. W. McCabe, chrmn. com.

Choteau, Minn.—Sealed proposal will be received until Sept. 6 for building a steel or iron bridge over the Marias river. A. C. Warner, co. clk.

Mountainhome, Idaho.—Bids will be received until Sept. 13 for moving and repairing the bridge over South Boise river at Pine Grove. W. H. Manion, clk.

Mt. Vernon, N. Y.—The council contemplates building bridges on S. Fulton and E. Lincoln-aves. and E. Third and E Sixth-sts. Edwin W. Fiske, mayor.

Cincinnati, O.—Bids will be received until Sept. 20 for building a railroad viaduct across the valley of Lick run. Bd. of trustees, comrs. of w. w.

Eau Claire, Wis.—An ordinance has been passed providing for a special election Sept. 6 to vote on the issue of $40,000 bonds for the construction of a new steel bridge.

Pittsfield, Mass.—A petition is being considered by the city council again asking for a new bridge across the river at South-st. to replace the one blown down.

Warren, Pa.—Bids are asked until Sept. 7 for plans for a bridge over Mill Race, and until Sept. 12 for constructing the same. L. T. Borchers, chrmn. co. comrs.

Seattle, Wash.—Bids will be received until Sept. 3 for the construction of a bridge on Road No. 71, over the Sammamish River, near Woodinville. E. H. Everson, clk. co. comrs.

New Philadelphia, O.—The Wrought Iron Bridge company, Canton, O., was awarded the contract July 28 for building the iron substructure over the Tuscarawas river for $9,500.

PARKS.

Augusta, Ga.—The question of establishing a public park is under consideration by the council.

Indianapolis, Ind.—This city has completed nearly all of the proposed purchases for park lands.

Westerly, R. I.—The question of securing land for the establishment of a park is being strongly urged.

Memphis, Tenn.—This city has purchased Winchester cemetery and will transform it into a park. Mayor Williams.

Detroit, Mich.—The park commissioners have granted a petition for improvements in Owen Park, Clark Park and Palmer Park.

Newark, N. J.—The Essex Park commissioners will expend most of the money realized from the sale of $500,000 worth of bonds in finishing up the work at Branch Brook and developing the west side and the Orange Parks.

Baltimore, Md.—The improvements and development at Cliften park are being rapidly pushed under Superintendent Noah F. Flitton. Owing to its natural beauty the park is destined to become a great pleasure resort for the public.

Butte, Mont.—Jas. H. Lynch, Henry Mueller and Chas. Schatzlein have been appointed a committee to solicit subscriptions for the purchase of the Columbia gardens. If successful the gardens will be converted into a park.

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GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Hazleton, Pa.—The question of garbage disposal is being considered by the council.

Cincinnati, O.—Mayor Hall, at Ft. Thomas, has recommended a crematory.

Knoxville, Tenn.—The erection of a garbage plant is contemplated.

Quincy, Ill.—The question of street sprinkling is being considered by the municipality.

Portchester, N. Y.—The question of garbage disposal, waste, etc., is being considered.

Bay City, Mich.—The question of securing a garbage disposal plant is under consideration.

Hagerstown, Md.—This city is considering the question of establishing a garbage disposal system.

Wilmington, Del.—The contract for removing ashes for the year, from Sept. 1, has been awarded to Jos. B. Stidham for $7,200.

Rochester, N. Y.—The board of health will again, according to press reports, consider the question of garbage disposal.

Utica, N. Y.—The council has passed over the mayor's veto the ordinance awarding the garbage contract to Henry Staffenbach at $6,500 a year for 10 years.

Saginaw, Mich.—Acocrding to press reports this city is in need of street cleaning appliances, such as sweepers, bags, scrapers, etc. J. J. Weale, supt. pub. wks.

Jersey City, N. J.—The City Refuse Utilization company has been incorporated to remove and utilize city, street and house refuse. Herbert Tate, Wm. W. Meen, incorporators.

Atlantic City, N. J.—The contract for collecting and removing the garbage for the next five months has been awarded to Sylvester Leeds for $4,400, and the contract for removing the garbage from the city wharf in scows has been awarded to Wallace Smith at 50 cents per ton of 2,240 lbs.

Los Angeles, Cal.—The new specifications under which bids will be advertised for street sweeping have been completed. Bids will be asked under three plans: 1—sweeping all streets by machines. 2—Sweeping business district by hand. 3—Sweeping all parts of the city outside a given business area by machines. Chrmn. Toll.

Milwaukee, Wis.—Bids were received, Aug. 12, for furnishing and installing a garbage disposal plant, as follows: Eagle Sanitary and Crematory company, $52,500 and $63,500; F. C. Gross and Joseph Schaaf, $58,500; F. H. Kratzer, $53,700; Dixon Garbage Crematorory company, $58,000; Gorman Bros., $61,000; Jacob Jacobi, $79,019.

Warner Stutler, superintendent of street and alley cleaning in the District of Columbia, has mailed copies of his annual report on the success of hand labor to the street and alley cleaning departments of all the principal cities in the country, with requests for similar information in return. He has also asked for data upon the removal of ashes at public expense.

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Municipal Engineering

VOLUME XV. OCTOBER, EIGHTEEN NINETY-EIGHT. NUMBER 4.

THE NATIONAL CAPITAL: ITS PAVEMENTS AND PARKS, AND ITS FORM OF GOVERNMENT.

The nation's capital will receive close scrutiny from the men who have charge of the physical improvement of American cities when the American Society of Municipal Improvements holds its fifth annual meeting there on October 26th, 27th and 28th. They will find there surroundings which will serve as good examples for much of the discussion in the convention, for in many respects Washington is physically a model city. It pleases the eye, and it is a comfortable place. Its streets are among the finest in the world; the green of trees and grass and shrubbery, and an intermingling of the brighter colors of flowers, spread over the whole city, giving everywhere nature's adorning touch to the improvement wrought by man's skill and genius. Washington will interest those who are striving to improve the public facilities of cities and to make them more beautiful. It is in every way a suitable meeting place for the progressive men who have under their charge this important work.

Washington's form of government stands alone and peculiar in its processes, and has undergone various changes in arriving at methods satisfactory both to the residents of the city and the rest of the country, for the administration of the city is subject to the rule of Congress. After the Continental Congress had convened in eight different cities, and had been well near worn out by the contentions of rival cities for selection as the permanent seat of the federal government, it was decided that it would be necessary to have the capital at a point absolutely under federal control, as complications would be likely to grow out of questions of jurisdiction if it should be located within the province of any state. The states of Maryland and Virginia, therefore, passed acts ceding to the federal government any portion of their territory which it might choose, and each offer was accepted by the selection of land from the two, embracing a total area of one hundred square miles on the Potomac river, which became the District of Columbia. This was divided into two counties, the Virginia portion being called the county of Alexandria, and that given by Maryland the county of Washington. Virginia's grant turned out a sort of Indian gift, as the state asked that the county of Alexandria be returned to its control, and, as congress found that the territory was not needed, the county of Alexandria was, in 1846, re-ceded to Virginia.

The district was first divided into three municipalities, known as the cities of Georgetown and Washington and the Levy Court, the last

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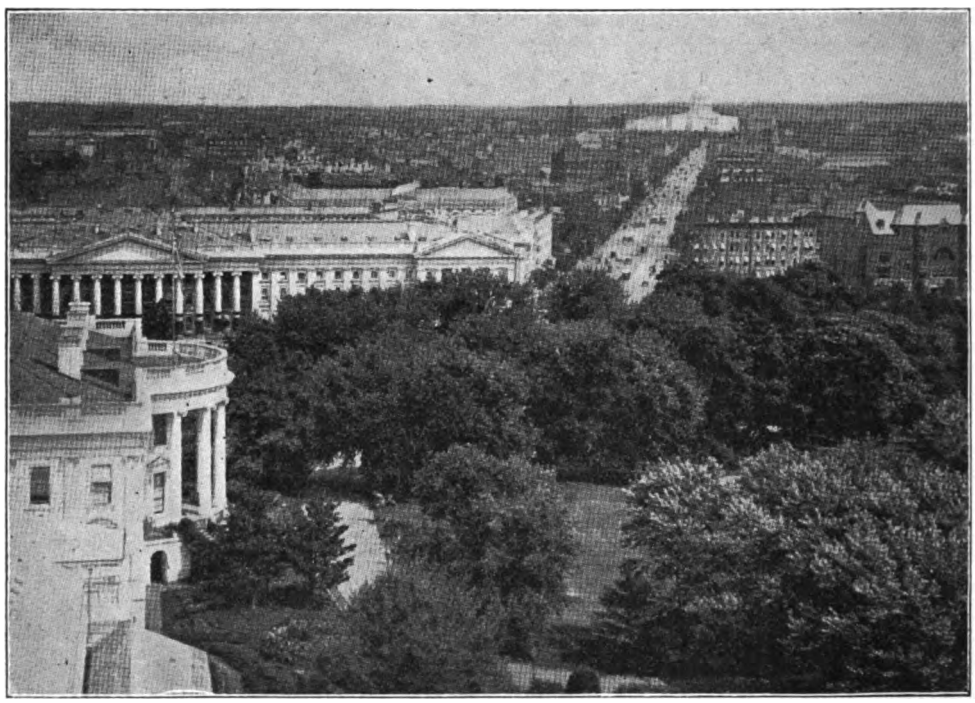
named having charge of the territory outside of the limits of the other two. At first Washington was governed by a council elected by the people and a mayor appointed by the president of the United States. Robert Brent was appointed mayor ten consecutive times. Then, for eight years, the city council was allowed to elect the mayor. This proved unsatisfactory, and for fifty-one years the residents of the district were permitted to biennially elect a mayor. delegates, with twenty-two members, and were also accorded the privilege of electing a representative in congress. "This consolidation of the local governments was brought about chiefly through the imperative demand for public improvements," says Mr. Clifford Howard, one of the secretaries of the present commission, in an article in *The Californian*. "The city of Washington had been laid out on such an elaborate and extensive plan, that the citizens, with



REAR OF WHITE-HOUSE. WHITE-HOUSE GROUNDS.
TREASURY BUILDING. CAPITOL.

A VIEW OF PENNSYLVANIA AVENUE FROM STATE, WAR AND NAVY BUILDING.

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with to pave their wide surfaces and grade their immense lengths. And so, for years, the capital was obliged to remain what Charles Dickens satirically styled 'a city of magnificent intentions,' and what we, in more forcible language called 'a national disgrace.'

"When, however, certain enterprising Westerners undertook to advocate the removal of the capital to St. Louis, as a point more nationally central, and, as a further powerful argument in behalf of their strenuous efforts, referred to the unsightly, inchoate condition of Washington, its citizens very naturally bestirred themselves to avoid the calamity of being thus robbed of their dignity and distinction, and the result was the establishment of the territorial form of government. Although this new form of administration enjoyed but a brief life, it so far sufficed to carry out the much-needed public improvements as to bring about that wonderful transformation which attracted the attention of the entire nation and gained for its authors a world-wide notoriety.

"The first governor, Henry D. Cooke, was enabled through the financial reputation of his firm—Jay Cooke & Company—to secure the immense sums required to make these improvements, which were directed and supervised by Alexander Shepherd, then executive head of the board of public works and afterwards governor. Thanks to the energy and perseverance of these two men, seconded by the enterprise and encouragement of its wide-awake citizens, Washington, from a forlorn, aimless town, became in a short space of three years a city worthy of being the capital of a great nation, and thus averted the doom which St. Louis would have wrought upon it. The condemnatory clamor, however, that arose on all sides against the vast expenditures and liabilities incurred for this exercise of the magician's wand precipitated the downfall of the territorial government in 1874, and the inauguration of a temporary administration under the immediate supervision of three commissioners appointed by the president of the United States, congress having come to the conclusion that the people of the district were not capable of judiciously managing their own affairs. In view of previous experiences it is probable that this paternal form of administration was thus temporarily established as an experiment, as it was not until after a satisfactory trial of four years that it was permanently adopted by the establishment in 1878 of the present and fifth form of government.

"This present local government of our capital is a municipal corporation embracing the entire territory of 72.09 square miles, ceded to the United States by the state of Maryland. In addition to Washington, the district contains the city of Georgetown and a number of villages—notably, Anacostia, Brightwood and Tenallytown. The city of Washington contains about ten square miles, and is laid out in accordance with the plan prepared by Major Pierre Charles L'Enfant, a French engineer, whose skill during the revolutionary war attracted the attention of General Washington, who honored him with the commission of designing the national capital. The plan is a systematic and altogether a very unique one. The city is divided into four sections, the northwest, the northeast, the southwest and the southeast, the capitol forming the central point of division. The streets run directly north and south and east

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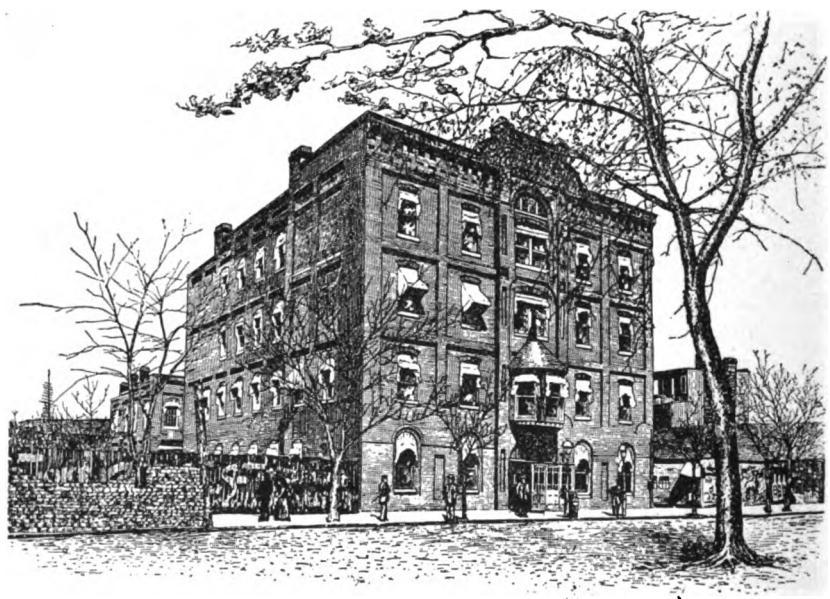
and west; the former being numbered in numerical order and the latter named after the letters of the alphabet in regular sequence. It is necessary, however, to bear in mind the location of the street, since every street is repeated (or is supposed to be) in each one of the four sections, and hence the reason for appending to Washington addresses the initials 'N. W.,' 'S. E.,' or whatever the particular location may require.

"The avenues, which are named after the states of the Union, cross the city diagonally in different directions, many of them radiating from the capitol, some from the White House, and others again, like Massachusetts and Rhode Island avenues, claiming no central point, but stretching their spacious, shady parking, while the intersections of the avenues with one another are marked by large circular reservations, very properly called "circles," each of which, with the exception of Iowa Circle, is named after and adorned with the statue of some notable American. Thus, at the intersection of Massachusetts and Rhode Island avenues is the imposing statue of General Scott, while at the Massachusetts and Connecticut avenues is that of Dupont, standing erect in the center of a beautiful parking. In addition to his many other memorials, George Washington is also honored with a statue and circle at the conjunction of Pennsylvania and New Hampshire avenues, while General Thomas, with his hat in hand as though acknowledg-



OFFICES OF THE DISTRICT GOVERNMENT.

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circles, there are other reservations as represented by Franklin Park, Judiciary Square, Lafayette Park, Farragut Square, Garfield Park, Mount Vernon Square, McPherson Square, Lincoln Park and Stanton Square, with their giant trees, their splashing fountains, their shady paths and knolls, their gardens and their appropriate statuary. Not only is the stranger captivated by the rural loveliness and the verdant charms of the nooks and parks that greet him at almost every turn, but each street is in itself a park, a sylvan lane, with its rows of wondrous shade trees, whose graceful, wide-spreading branches, in many instances, meet above the roadway, forming exquisite vistas, which stretch away into dreamy woodland, or form the charmed, umbrageous entrance to some resplendent park. For miles and miles in many parts of the city every dwelling, from the lowly hut of the negro to the palace of the millionaire, has its private parking or front yard, with vine-covered terraces and porches, with trees whose foliage mingles with that on the sidewalk; with rare shrubs and flowers, and fountains whose sprinkling mist transforms the slumbering sunbeams into dancing, iridescent sprays. Looking from the top of the monument on a morning in early June, when nature revels in the glory of her renewed life, Washington lies beneath the beholder with its glistening church-spires, and tall buildings of shining marble, and the deep red brick of the lofty domes and towers peeping above the mass of virescent foliage. Here and there may be seen the grand avenues as they stretch their splendid [illegible] wends its mighty way toward the ocean in slow, sluggish roll.

"The statues are not confined wholly to the squares and circles, but many, like that of Benjamin Franklin, cast their shadows upon the noisy street, or like that of John Marshall, keep their silent, stolid guard before the portals of some great building. Probably the most interesting of these apotheosistical monuments is the colossal statue of General Jackson in Lafayette park, immediately facing the White House, and made from the brass of old cannons captured by him. Here 'Old Hickory' is compelled to sit forever on a horse raised on his haunches, with no other support for his massive self and his heavy rider than his hind legs—a feat in statuary which the learned world said could not be performed until Clark Mills, like Christopher Columbus, demonstrated that the world does not always know everything. A statue of Lafayette has recently been erected at the southeast corner of Lafayette park, the only monument to a foreigner in the city; and, therefore, an honor of which the French people may justly feel proud."

Mr. Howard's interesting article in *The Californian* becomes quite enthusiastic on the subject of the streets of Washington. "Notwithstanding that the capital was laid out a century ago," he says, "when city thoroughfares were ostensibly designed for the purpose of allowing neighbors to shake hands across the street and of losing themselves around the corner, the streets and avenues of Washington are without their equal at this day, and we may well marvel at the audacity which prompted so elaborate a de-

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miles before the visitor reaches the city, the streets are the first feature to attract his attention by reason of their great length, their unusual width, their multitude of shade trees and their smooth asphalt driveways, over which the rapidly-moving vehicles glide with a quietness and ease at once astonishing and delightful to one accustomed only to cobble-stones and dusty roads. So smooth are these pavements that hundreds of children use their parlor skates almost exclusively in going about from one part of the city to another, and it is not difficult to understand how, with such streets, Washington should prove a veritable paradise for its 35,000 bicycle riders. Bicycle riding in Washington is as common a means of locomotion as walking; in fact, everybody is supposed to know how to ride a wheel and

with his bag of letters, the young girl skimming to school with her books strapped to the handle bars; the ragged darkey boy; the spruce young man, the progressive mother, with her baby tucked into a little seat in front of the machine; the mercurial district messenger, the reporter, the grave clergyman on his way to church and the happy tippler on his way to ruin—all are scurrying along on safety bicycles to their respective destinations, attracting no more attention than do the pedestrians on the sidewalk.

CITY HALL.

"Pennsylvania avenue, northwest from the capitol to the treasury, is the main portion of the principal thoroughfare in the city and one of the grandest avenues in the world. Like nearly all the avenues, it is 160 feet wide, thus

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find their way to the avenue, it presents a most enlivening scene, its great size seeming then hardly sufficient to accommodate the mass of people and the crowd of vehicles passing up and down.

"Washington has its fashionable promenade in Connecticut avenue, from Farragut Square to Dupont Circle, upon which are located the residence of the British legation and the Church of the Covenant. Generally, however, Connecticut avenue is not so beautiful nor so conspicuous for its residences as some of the other streets in the fashionable northwest section of the city where the palatial homes dition to its many pet names, the 'City of Residences.' These hundreds of handsome houses, each one vying with the other in some peculiarity of style, some architectural characteristic, some elaboration of design or some variety of ornamentation, resulting in a city of buildings, no two of which can be said to be precisely alike, and which range in style from the baronial to the most extravagant modern architecture, constitute one of the many characteristic and attractive features of the national capital. With these ornate peculiarities—its broad, shady streets, its gardens, its parks, its homes and

ASPHALT PAVEMENT ON M STREET, BETWEEN 8TH AND 9TH STREETS, N. W., LAID IN 1878, SHOWING CONDITION TWENTY YEARS AFTERWARD.

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to a commercial or mercantile center—Washington is a city of which all may well be proud. * * *

"The water supply of the district is obtained from the Potomac river by means of an aqueduct about twelve miles long and nine feet in diameter. This portion of the supply system is under the charge of a United States officer, who sees to it that the aqueduct is kept in repair, and that the settling and distributing reservoirs are properly cared for, while the commissioners attend to the furnishing of water to the citizens, who, in turn, testify their appreciation of the excellence of this conjunct system by daily consuming 35,000,000 gallons of water, or about 150 gallons a day for every individual. In 1882 Congress became impressed with the idea that it was essential for the welfare of the people that the water supply of the district should be increased, by the construction of a subterranean aqueduct about four miles long, through solid rock, from a distributing reservoir beyond Georgetown to a reservoir with an estimated capacity of 300,000,000 gallons, to be constructed in the northeastern section of Washington—the work was abandoned because of certain complications, and Congress contented itself with having a four-foot water main laid instead, and, with its usual thoughtfulness, did not neglect to charge half the cost thereof to the disgruntled taxpayers."

The affairs of Washington, under its present government, are administered by a board of three commissioners, namely—John B. Wight, John W. Ross and Capt. Lansing H. Beach, two of whom are appointed by the president from among residents of the district, and the third is detailed from among the corps of engineers of the army. All other officers and employes of the district government are appointed by these commissioners. It is the custom of the commissioners to elect as president one who represents the dominant party, but he is vested with no authority not exercised by his associates, except that he officially signs documents for the commission. The work is divided among them, each having charge of certain departments of municipal affairs. Under the latest assignment of the business and offices of the district government

IOWA CIRCLE

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pital for Women, coroner and assistant coroner, board of dental examiners, druggists to the poor, excise board, fire department, inspection of flour, inspection of food, collection and disposal of garbage, hack stands, harbor master, hay scales, health office, insurance companies, liquor licenses, inspection of lumber, markets, including Hay Market square; board of medical examiners, care of municipal building, transportation of paupers, physicians to the poor, commissioners of pharmacy, police, disposal of police rewards, poundmaster, board of control of Rock Creek Park, sealer

DUPONT CIRCLE.

of weights and measures, board of examiners of steam engineers, surgeons of police and fire departments, veterinary surgeons, telegraph and telephone service, inspection and measuring of wood.

Commissioner Ross—Almshouse, Asylum Hospital, Washington; assessments of general taxes and special assessments other than water assessments and rents; assessor; assistant assessors, board of; attorney's office; attorney, special assistant; auditor's office; bathing beach; claims vs. the District of Columbia; charities, superintendent of; charitable and reformatory institutions receiving aid from the district government; collector of taxes; disbursing officer; dog tags; insane, commitments of; library, free public; licenses, other than liquor; gauger and inspector of spirituous liquors; municipal lodging house; property clerk; public schools, board of trustees of; reform school (boys), trustee of; Rock Creek Park, board of control, president of; sweeping and cleaning streets, avenues and alleys; tax sales; work-house.

Commissioner Beach—Asphalt and cements, inspector of; bridges, engineer of; buildings, inspector of; chief clerk, engineer department; computing engineer; conduits; contracts, preparation and record of; electrical engineer; elevators, inspector of; fire escapes; gas and meters, inspector of; highway extension plans; lamps, superintendent of; lighting, street, gas and electric; parking commission; parking, supervision of; parking, superintendent of; pavements; permit clerk; plumbing board; plumbing, inspector of; plumbers, examination of; property, superintendent of; river front; roads, superintendent of; Rock Creek Park commission; Rock Creek Park, board of control; sewers, superintendent of; sidewalks; stables, engineer department; street railways, supervision of; streets, superintendent of; subdivision of land; surveyor; telegraph and telephone lines; trees; water department, chief clerk and registrar; water department, superintendent of; wharves.

The engineer commissioner is assisted by two other officers from the engineer corps who also are detailed for this duty by the president. Neither of these officers receive pay from the district. The engineer commissioner receives only so much as will, with his pay from the army, make his compensation $5,000 per annum, the salary paid to each of the other commissioners.

Much of the work is done

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through the secretaries. The secretary of the commission is Dr. William Tindall, who has held the position since the creation of the commission, and prior thereto was secretary to Mayor Bowen, Governor Cooke and Governor Shepherd during the entire term of each. The assistant secretary is Mr. Clifford Howard, to whom we are indebted for much of the information in this article. He is a native of Pennsylvania, is twenty-nine years old, has been in the District service for nine years and is well known as a writer. The other secretaries are Mr. Frank C. Roach, with President Wight, Mr. Francis Nye, with Commissioner Ross, and Mr. Moncure Burke, with Capt. Beach.

The people of Washington share equally with the federal government 1¼ cents per square foot and one-half the cost of a sewer or an alley or sidewalk pavement is charged against abutting property. The license charges embrace nearly all kinds of business. All revenues, when collected, are turned over to the treasurer of the United States, who acts as treasurer of the district. The total expenditures on account of the district amount to about $6,000,000 annually.

The members of the American Society of Municipal Improvements will be specially interested in the pavements and parks of Washington. There has been longer experience in Washington with asphalt paving than in any other city in the country. The first asphalt pavement was laid there under the supervision of a special commission, and some of

HARRISON VAN DUYNE,
President American Society of Municipal Improvements.

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pany, was once engineer commissioner of Washington. The scientific knowledge of asphalt paving has been largely developed in the engineering department of Washington, and Mr. A. L. Barber, the founder of the business, started there. Capt. Beach, the engineer commissioner, is in charge of the local arrangements for the convention of the American Society, and will do all in his power to make the meeting instructive, as well as pleasurable. Information regarding the arrangements for the meeting will be found elsewhere in this number.

ASSESSMENT FOR SEWERS AND WATER MAINS.

By Charles Carroll Brown, M. Am. Soc. C. E.

The questions regarding methods of assessment for sewers and for water mains have usually been considered separately, but from nearly every point of view they are similar and the conclusions reached are based upon the same principles. The commercial side of water-works, with the fact that they are frequently owned by private companies, has perhaps tended to conceal their close connection. The location and construction of sewers is taken entirely out of the hands of the property owners in many cities and in some states, a power to veto the expenditure being the only power, if any, left to them. In few cities is this true regarding water pipes.

As our cities increase in number and size the difficulty of securing pure water supplies increases and the private well or other such supply must be condemned, so that but one source can be used. Sewer and water systems then are both sanitary appliances of the city and must be equally under its control. Whatever improves the condition of the city is of general benefit to all its citizens and should be paid for from city funds raised by general taxation. No small portion of the total cost of both sewer and water systems should be assigned to the city at large. Thus in the sewer system, disposal works, outlet sewers, intercepters, those portions of main sewers which serve in part as either, may be made a general charge, or in part a general charge and in part an assessment upon the drainage district benefited; and in a water system the reservoirs, stand-pipes, pumping plant, supply mains, and perhaps some portion of the larger distributing mains should be treated in the same way. The proportion to be so assessed will depend upon the relative cost of these portions for common use and the distribution or collection systems.

Local sewers and water mains are mainly of direct benefit to the adjoining property. In the case of sewers the construction is the main expense and the cost of cleaning is so generally distributed over the entire system that it is usually made a city charge. The first cost is the only amount to be assessed upon the property therefore. In the case of water supply the laying of mains is but a small part of the total expense. Many lines are laid through streets where the property is not yet improved and their presence is a direct enhancement of its

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value, as well as of the value of property already improved. Perhaps the direct assessment of the actual cost of the main is as equitable a method of assuming this increase value as any. In case the main is a large one intended to supply a large district, a portion of its cost should be assessed upon the entire district, or paid from the city treasury, leaving the estimate cost of say a 6, 8 or 10-inch pipe to be assessed on the property.

The cost of supplying water through the mains is practically proportional to the amount of water supplied, and this is properly assessed upon the consumers by meter rates or flat rates so fixed as to approximate as closely as possible to such a proportion the cost of fire protection and water for public purposes to be paid by the city.

The common methods of assessing the cost of sewers are by frontage, by area and by valuation, with some instances of assessing for the number and size of connections. Unquestionably the sewer is a direct benefit to the property, whether improved or not, by its simple readiness for use, and a part of the cost should be assessed directly upon the property in proportion to its frontage, or perhaps better, its area, as in the case of the cost of construction of water pipe. The use of both water and sewer systems being compulsory for the system of assessment under consideration, another portion of the cost is just as much proportional to the amount of use made of the system as the cost of furnishing water is. This use must be estimated in most cases. Only for new systems in districts already populous or in reconstructions can such an assessment be made directly. A definite schedule of rates for making connections, to be paid when the permit for making connection is issued, would be the nearest to an equitable assessment of this portion of the cost if the city can carry the debt until the property is ready for the connections. Carefully prepared regulations by the health department or other competent authority fixing sizes of connections and regulating and enforcing connections are a necessary accompaniment of such a system. In residence districts the cost of an eight or ten-inch sewer might be provided for in this way. The excess over this cost, being due largely to size necessary to carry off surface water, is a large part of the direct benefit to the vacant lot, to be assessed directly. If the sewer drains a large district, the excess over the cost of a fixed size should be assessed on the district benefited or assumed by the city. If a schedule of rates for connections is impossible, the next approximation is an assessment of this portion according to valuation of property. Such a division may be far from equitable in a new district, as it is impossible to foresee the uses that will be made of the property.

The following cities make some approximation to the methods proposed:

Brookline, Mass., 75 cents a front foot and ¾-cent a square foot on the area of the lot counted 100 feet deep and the remainder is paid by general tax.

Brockton, Mass., assesses 15 cents a front foot, 0.3 cent a square foot on the area of the lot, counted 100 feet deep, a rental of 30 cents per 1,000 gallons of water used and the remainder by general taxation, these being considered to approximate the proportions of one-half rental, one quarter direct assessments by area and frontage, and one-quarter general tax.

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The favorite methods at present are by general tax; mains, all, or all except the value of a local sewer by general tax, laterals by assessment on property benefited; storm sewers, general tax, sanitary sewers, local assessment; one-quarter or one-third general tax and the remainder local assessment; local assessment of entire cost; assessment on sewer district of all sewers therein.

PRACTICAL LEGISLATION FOR BETTER ROADS.

By William T. Beatty.

Better roads, not good roads, should be the war-cry of the improved roads propaganda. It is useless to strive after the unattainable. The stone road is the only really good road the year round, and for four-fifths of the country it is, and will be, unattainable for many decades. This is due to several causes, principally, lack of means in sparsely settled communities where stone is obtainable, and lack of stone in large sections of the country that may be either with or without the means of utilizing it if they had it. Better roads are within the reach of all, and the good roads movement, which has hitherto confined its efforts largely to a consideration of the ways and means of procuring, and the methods of constructing, stone roads, should enlarge the scope of its operations by endeavoring to stimulate and assist every community, no matter what the present condition of its roads, to obtain better ones, and just as much better as it can afford, even though stone roads may be far beyond its reach. Volumes have been written and miles of speeches discharged in demonstrating the enormous cost of hauling the country's products to market over mirey, mucky, rutty roads and comparing it with the expense of transportation over hard, smooth, level road-beds. This striking comparison is put forth to the people of the United States as an incentive to construct stone roads. But of what use is it to talk stone roads to the farmers, who are the tax-payers, in the great prairie states where most of this enormous tonnage is produced and where good roads are the most needed? They have struggled along through mud and water during half the year as long as they can remember, with taxes always as heavy as they are willing to bear. If they are approached on the subject, and some more than usually enterprising spirit among them takes the trouble of reducing the proposition to a practical basis, he discovers for their edification that stone of fairly satisfactory quality is obtainable one hundred and sixty miles away; that the machinery necessary to begin constructing stone roads economically will cost about $2,000; that after it is purchased each mile of stone road will cost just twice the amount of the yearly road tax of the whole township. If the community happens to be a particularly progressive one, and, even in the face of such discouraging conditions, evinces a disposition to make a start in a small way, it is immediately confronted with the fact that there is no legal way in which it can purchase the machinery and have its payment distrib-

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uted over several years. They must levy the tax and pay the whole amount in one sum. This being more than they are able to bear, puts a quietus on the scheme, and stone roads being out of the question, it is not considered worth the effort to attempt to substantially improve their seemingly hopeless dirt highways, and the whole matter is dropped.

from bad to good, without taking the intermediate steps, has not been productive of results. Much has been done in some few parts of the country, to be sure, but it is insignificant compared to what might have been done if systematic, well-directed and continued effort had been going on all over the country to better the condition of the roads without trying to attain an im-

CALHOUN STREET, NEW ORLEANS, BEFORE PAVING.

This is an illustration of conditions that prevail over considerably

possible standard. There is as much difference between a well-crowned

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has been expended in trying to obtain the generally impossible stone road, a vastly improved condition of highways would be in existence to-day. What is needed to bring about this desirable state of affairs is not state aid, but state legislation whereby the people can aid themselves. The idea that is beginning to prevail, that better roads can only be secured by the state engaging to shoulder part of the expense, is an erroneous as well as injurious one. It stifles local effort and retards progress. Wherever it is under discussion, even in the most tentative way, there will be found a disposition to hold back to see what the state is going to do. Officials are reluctant to take the initiative in any movement, and the people hesitate to encourage them, all fearing the expense to be incurred will be thrown away, as by waiting another year or two a portion, or all, of it will be borne by the state.

It is a matter of record that in those few states where state aid is an accomplished fact all progress in road improvement was practically paralyzed for several years prior thereto and the slightest agitation of the subject in other states is being attended with similar results. State aid, however desirable it may be, is unobtainable in many states for years to come for various reasons. In some states the conditions of the road problem radically differ in different sections of the state, rendering it almost impossible to get the people to unite on any effective law. In other states it is unconstitutional and even after the people have been able to agree, the tedious and difficult process of amending the constitution must be gone through with. After all, the inhabitants of the particular district or township improving its roads are the ones who reap nine-tenths of the benefits therefrom and on them the expense should rightly fall.

There is a vast difference in the standards of civilization as well as in the financial standing of different sections of the same state. Some communities are far in advance of others, they are ready for better roads now they realize the need of them, appreciate the value of them and are prepared to stand the cost of them, provided some method of defraying the cost can be provided whereby its payment can be distributed over several years and not come with crushing weight in a single immediate payment. The initial cost is the obstacle that blocks the road. Better roads, of whatever sort, mean road machinery. If it is replacing dirt roads with stone roads, it means substituting earth handling machinery with stone road machinery. If it is exchanging the old worn-out channel that has done duty as an apology for a road for a high class drained and graded earth road, it means substituting the pick, shovel, plow and scraper of past ages with modern, highly improved earth road machinery. On this feature the history of every branch of successful industry is significant.

America has attained her prominence in all departments of manufacturing, agriculture and transportation by taking the lead in their mechanical development. She has multiplied the product of her physical force above her competitors by producing and utilizing more effective machinery and by so doing has passed them in the race for industrial supremacy. Just such a lesson must be learned in the road improvement industry before it can take the place it should have in the country's industries. If road

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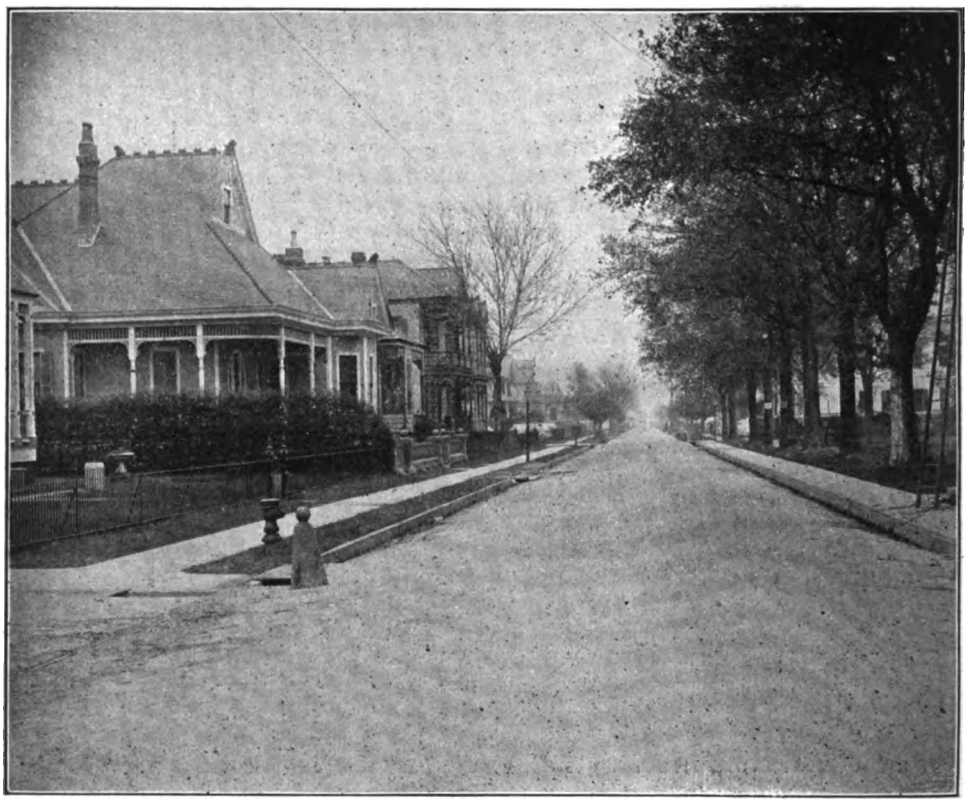
taxes are already as high as the people will bear, the only way to improve the roads is to improve the methods of building and preserving them. In so doing the people will at the same time be educated up to a higher plane where they will begin to realize that any increase in taxes that brings a commensurate improvement in the roads is an actual investment, paying dividends in added valuation to properties and lessened expense

results been realized in recent years than in road machinery. It now comprises a large line of modern, effective implements, the capabilities of which, in the line of their work, will astonish the unitiated.

A township raising and spending a thousand dollars a year on its roads finds them growing yearly worse, if such were possible; at all events it finds absolutely no improvement in their condition from year to year. Let such a town-



CALHOUN STREET, NEW ORLEANS, AFTER PAVING WITH ASPHALT.

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cellence possible for dirt roads in a marvelously short time, and can be kept in that condition. It will also find its improved dirt roads so far in advance of those it has come to consider inevitable that it will find difficulty in recognizing them. Or, let a township in which stone abounds, but has never been used on the roads, and which spends two thousand dollars a year on its dirt roads, invest two thousand dollars in machinery, fifteen hundred dollars in stone road machinery and five hundred dollars in earth road machinery. It could then apply half its revenue to building stone roads and the other half, by the use of machinery, would maintain and improve the dirt roads. It could go on adding to its stone roads from year to year until its main roads were all stone, for the people will voluntarily add to the revenue after experiencing the effects of the better road.

Tracts, pamphlets, magazine articles, speeches, etc., reach a certain class, but are slow to act on the farmer who is the main factor in this problem. He is suspicious of new methods and new notions and especially so when they savor of new taxation. Until he is fully convinced he will avoid all risk by voting "No." Let him once have the use of one-half mile of good stone road, kept in good repair, for a year and he will do a lot of thinking every time he strikes that road and it will be thinking to a purpose. After one or two rainy "spells" he is a convert and needs no more good road talk for himself. He becomes a missionary in the cause and discusses ways and means.

But how are these townships going to procure this machinery? The roads require constant attention to keep them even passable and a year's revenue can not be diverted to its purchase. In a large majority of the states there is no law under which any purchase can be made and paid for in installments running several years. Any attempt to stretch or strain the laws, even for so desirable a purpose, can and has been repeatedly upset by some single obstreperous and unconverted citizen. What is needed is legislation of the local option order, whereby a majority of the taxpayers in any township or district could petition their road commissioner to purchase certain necessary machinery at a stated price, payable in a stipulated number of yearly installments, at the legal rate of interest, no payment exceeding one-half the yearly revenue of the township or district making the purchase. Under such a law the township with the one thousand dollar revenue could buy a thousand dollars worth of machinery on five years' time, payable in five annual installments of two hundred dollars each and interest. There would be no increase in the taxes and the remaining eight hundred dollars applied each year to operating the machinery would be productive of far greater results than the whole thousand dollars without the machinery. Or, a road district with an annual revenue of one hundred dollars could purchase two hundred and fifty dollars worth of machinery on five years' time and have the best roads its money could make instead of the poorest. By this method it would be impossible to saddle on the township or district any undesirable debt, as it requires action by a majority of the taxpayers. At the same time it enables a progressive and enlightened majority in any community to accomplish its purpose, which at present can not be done.

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Legislation on this order would be productive of much greater immediate results than any plan involving a general system of state aid, which is sure to meet with bitter opposition for many years. With such a law the advanced communities will forge rapidly ahead and practical object lessons in good roads will spring up all over the state. This will bring about a condition of rivalry between counties and townships that will be of the greatest assistance in furthering the good cause and the retarding influences of the chronic obstructionists that reside to some extent in nearly every locality will be minimized. They will not be able to hamper action by the majority as they do now. In addition to such legislation, in all those states where the term of office of road officials is only one year, it should be extended to at least three years. It takes one year for the incumbent to become familiar with the duties of his office and to acquire the experience necessary to its proper conduct and, if an officer is competent to hold a position at all, his second and third year in office will be of far more value to his constituents than his first and should be free from the entanglements of a yearly election.

A COMPARISON OF THE COMBINED AND SEPARATE SYSTEMS OF SEWERAGE.

By C. P. Collins, C. E.

Of the three essentials to human life, air, water and food, the one which should be specially sought is pure water. Vigor is essential to the advancement and happiness of every individual, and strength and happiness of the people are essential to good public morals, good public government and sound public prosperity. Sanitary improvements are therefore among the first and chief duties of public officers and guardians, and should ever be the objects of most earnest thought to those in whose charge and under whose directions these improvements are furthered.

No town or city can submit to a pools, sewers and stable-yards. The man who permits his family to use water impregnated with fecal substances, that the bodies of other persons or animals have already excreted, and the authorities who permit their citizens to use such waters, open for them the gates to aches and pains, and weakness of mind and body.

There is no community, there are few families and comparatively few animals, without disease. In very large communities there is rarely a time when some virulent disease does not exist, and unless the excretions from such source are properly disposed of, much

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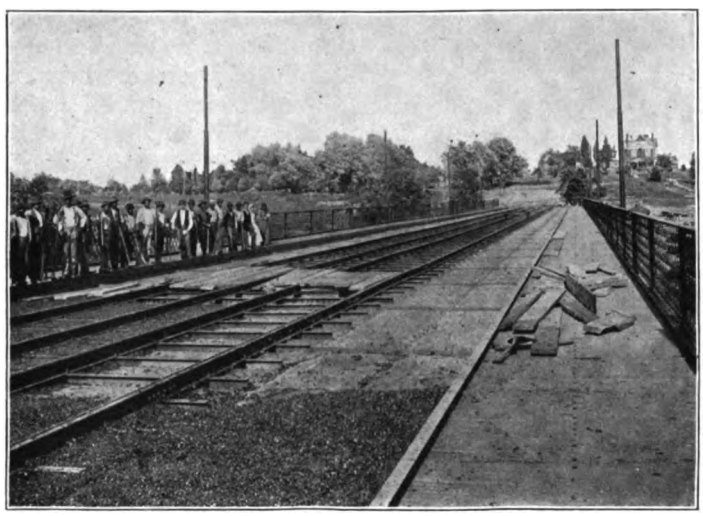
mankind may be speeded away to points where they can do no harm.

Engineers themselves who have spent their lives in sanitary work differ widely as to the best plan to pursue, and rarely any two men will wholly agree on some of the most vital points. The methods of sewage disposal usually adopted may be spoken of as crude disposal, disposal by irrigation and filtration and disposal by chemical precipitation.

Crude disposal contemplates discharging the sewage in its crude or unclarified state into some near water-course or body of water. This is usually by far the cheapest methods of disposing of the sewage, and where the flow of the stream or body of water is large enough to sufficiently dilute the sewage crude disposal may be admissible.

ness of the soil. The water, freed from the matter in suspension, descends still further into the ground, coming in contact with the air in the earth. The impurities which it contains are therefore oxydized, that is, purified by the action of the bacteria, dependent for life upon oxygen contained in the air. The purified liquid may descend still lower, or it may be carried off in underground drains, laid for that purpose. The insoluble matter contained in the soil is also oxydized by slow combustion and thereby reduced to a fine powder and mingles with the elements of the earth.



FIRST COURSE OF BITUMINOUS CONCRETE ON WEST EIGHTH STREET VIADUCT, PRICE'S HILL, CINCINNATI.

There is a distinction between irrigation and filtration. In irrigation only so much sewage is applied as will be beneficial to vegetation. In filtration the quantity applied is governed by the amount the soil

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In irrigation the prime object more often is the profit that may be derived from the crops raised. In irrigation a much larger area is needed to dispose of the sewage than when filtration is practiced.

Chemical precipitation consists in collecting the sewage in tanks, having just previously mixed with it certain chemicals, the result of which is to precipitate all matter in suspension and the portion of the material in solution. A semi-fluid mass collects at the bottom of the tank, called sludge, which may be drawn off or pumped into beds to drain or dry out.

THE COMBINED SYSTEM.

The combined system is one with which all towns are more or less familiar. It consists of a single set of sewers, calculated to receive and carry away a certain portion of the storm water flowing on the surface and all the house drainage and industrial waste produced along lines of streets where sewers are laid. Mechanically considered it performs all these offices in a satisfactory manner and seems to comply with the leading requirements of purely engineering considerations.

It prevents sidewalks and streets from being overflowed during ordinary storms and generally disposes of the surplus water, clean or foul, with a considerable degree of completeness. But let us see if there are not some defects in this method of disposal, even though some of the larger cities in this country have adopted the combined plan and consider it the most economical and practical one. In order to provide for the removal of storm water the sewers are made larger than is required for house drainage only, so that during an interval between storms, the stream which would be ample to keep the sewer properly flushed were the diameter small, is spread out over a larger surface and loses its power to keep it clean. The sewer being large, its air-space is large and ordinary methods of ventilating fail to change its contents with sufficient frequency to prevent the formation of foul gases. The drainage from the streets carry into the sewer foul rubbish of every sort which remains deposited there to a greater or less extent. These deposits form a nucleus for further accumulation of putrefaction from the solid matter of house drainage leading to a great foulness of an unfrequently changed atmosphere, thereby requiring the house communications to be carefully trapped, less they deliver foul and infective air into the interior of dwellings.

As combined sewers are made so foul in this way it is also of great importance that their atmosphere be trapped away from the streets and also that the amount of foul deposit may be reduced; it is necessary to keep street rubbish out of them and thus their inlets from the gutters are shut off by trapped catch basins. This becomes the receptacle of sand, straw, chips, mud and droppings from the street forming together, especially in warm weather, a polluted rotten mass, a source of local infection and the dangers thereof are manifest to all.

The whole tendency of modern investigation is to show that the zymotic diseases are produced by bacteria, whose germs are developed under favorable conditions. It is well known that the most favorable conditions for the growth of these low organisms are heat, moisture, darkness and presence of ammonia. The damp walls of sewers present therefore all the requirements for

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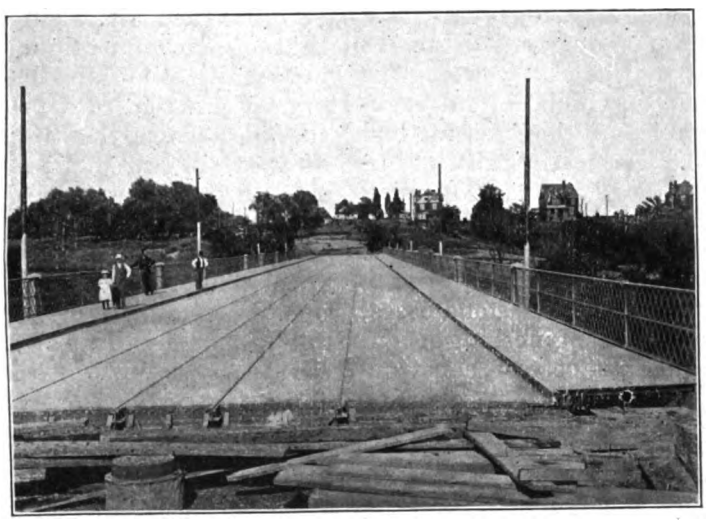
the most abundant growth of these bacteria whose germs may float off on the sewer air and be carried into dwellings, by mechanical action, as dust is borne into our windows.

Large sewers necessarily become the hot-beds for the propagation of these deadly organisms, the moist porous walls forming a good soil for this pestilent growth and the ammonia from the sewage supplies the nutriment essential for their development, the damp, moist and warm air completing the process.

a coating on them, as the flow decreases.

The velocity of the stream being great, enough power is gained to carry along with it particles of solid matter which, as the stream subsides, are deposited along the water line of the sewer; these deposits form miniature dams at first, but are greatly enlarged by the constant addition of solid matter from house drainage, which, during the dry weather, leave not sufficient depth of flow to carry them on.



COMPLETED ASPHALT BASEMENT ON WEST EIGHTH STREET VIADUCT, PRICE'S HILL CINCINNATI.

The storm water falling per hour in violent rains over an area of closely built up city land is nearly fifty times the amount of waste water and sewage produced per hour in the same area. The sewage therefore is a mere trickling thread in the bottom of a sewer, large enough to carry off storm water.

Let us suppose the sewer in ques-

Foul gases are then emitted, and it has been popularly assumed that these gases (called "sewer gas") are the cause of disease.

The occasional flushing of these large sewers, while it may clean out silt and accumulated filth, and thus decrease the amount of heat and ammonia from decomposition, can never prevent the growth of bacteria on the sewer walls, nor will

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from them is still deadly. Experience, therefore, has taught and is teaching that there is some radical defect in the system of large or combined sewers. Perfect plumbing may prevent sewer-gas from entering dwellings, but perfect plumbing is the rare exception, especially when a landlord foots the bills. In view of these facts, are we not forced to conclude that the "Combined System of Sewerage" is defective, if not an utter failure as far as sanitary requirements are concerned?

Each and every town has, as a rule, certain requirements to be met, when a system of sewerage is to be devised, which should regulate the choice of the best method to pursue. Naturally great attention should be given to the question of economy, and, other things being equal, economy should control. At the same time other things are seldom equal, and, in some cases, economy, i. e., engineering economy, or the first cost of construction, without reference to the value of the result, should be placed as secondary in importance.

Where the special requirement is to dispose of a surplus of surface water during storms, this object should be in precedence of all else, yet the sanitary requirements must not be forgotten.

All sanitarians are agreed that the chief aim, as far as the removal of foul waste is concerned, whatever may be the system adopted, should be immediate and complete, and this principle of immediate and complete removal should apply to all laterals, as well as main sewers, and be a universal requirement.

THE SEPARATE SYSTEM.

Let us now turn attention to the "separate system." In this method the chief aim is to separate the house drainage from the surface drainage, and storm water, where it is necessary to be carried off in conduit, is disposed of through special storm water sewers.

By this separation much smaller sewers will suffice for the house-drainage, and on this account the flow through them will be more constant, and there will be less chance for deposits, and less wall surface will be exposed, on which bacteria can germinate, and there will be less space for storing up germ-ladened air. The gases and heat of decomposition, which so powerfully stimulate the growth of organic matter, are prevented by thorough daily flushing, which is only possible in small sewers. The smooth glazed surface of the pipes is unfavorable soil for this vegetable growth, compared with the porous bricks, moistened with sewage.

So much smaller sewers will suffice to carry off the sewage only that their cost need be but a fraction of what would be required to build sewers admitting rain; and by adopting the former, many towns can avail themselves of the benefits of sewerage, which would otherwise be prevented, by this extra expense. Comparing the cost of the sewers of Chicago with those of Memphis, the estimated first cost of the combined system proved to be 2½ times that of the separate system, not admitting rain.

In places of moderate size the accumulations of storm water can be led by short and inexpensive drains, directly to a suitable outflow, without being taken in artificial channels over a longer course; and it applies to a greater extent than is generally supposed to large cities.

Since the separate system underwent its first test at Memphis in

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1880 and from that time on has been known as the "Waring System of Sewerage," it has been adopted by at least sixty towns and cities, and the results are most favorable.

Mr. Chas. H. Latrobe, C. E., of Baltimore, referring to the separate system, says: "The introduction of roof or yard water, with the amount of rubbish of one kind or another, which it always contains, and the air in state of a greater or less compression, which is always carried down the roof-leaders, is simply the introduction of a disturbing element, which renders the smooth and regular action of the system a matter of impossibility. Storm water introduced into the system can cause great trouble by the introduction through back-pressure of noxious and dangerous gases into the houses connected with the system, whilst during their discharge, and by the large body precipitated into the dead end of the sewer, sweep out with one rush any chance of accumulations of filth."

The flush caused by the introduction of rain water through sewers is constant, and wholly dependent upon its intensity. The flush from an automatic flush tank is sudden and violent.

Considering 1 inch per hour as a maximum rainfall, from the roof of a house 25 feet x 50 feet in size, or 1,250 square feet in area, there would flow 104 cubic feet or 780 gallons in one hour. The flush tank discharging 160 gallons into the sewer in 55 seconds, which was the average capacity of those used at Memphis, would have great advantage over the former; for, while the roof discharges 780 gallons in one hour, in 55 seconds it would discharge 12-$\frac{37}{77}$ gallons. So, even

A VIEW OF RACE STREET, CINCINNATI.

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Engineers and sanitarians are inclining more and more to the belief that it is rarely, if ever, expedient, to dilute sewage with storm water and to befoul storm water with sewage, in the attempt to remove both by the same underground channel and neither now doubts the absolute impropriety of applying this system to small cities.

While a foul and ill-ventilated sewer is always a source of danger and much worse than none at all, a well planned, well built, well used, well ventilated and well flushed sewer, approaches very near to sanitary perfection.

PARK BRIDGES.

By Oscar Sanne, Mem. W. S. E.

I think the more our country is settled and people commence to enjoy life and look more for an æsthetic development there will be a growing demand for a combination of engineering skill with highly artistic achievements.

During the last five years I have designed and built for the Lake Park of the city of Milwaukee several ornamental bridges. Starting with a simple foot bridge, built as a viaduct over a very picturesque ravine, I have gradually developed a system of park bridges which are not only strictly engineering structures, but which have been very carefully laid out with the view of obtaining the most pleasing artistic effect.

To obtain this result it is necessary that the engineer, being entrusted with such an unusual task, should carefully study everything about the laws of beauty when applied to construction. To show a steel structure in the most beautiful harmony of its details is often more difficult than to solve the most complicated mechanical problem. This kind of engineering work can not be done in a rush or by the thumb rule, but requires careful and thorough study of every detail; all proportions must be well weighed, so that a pure harmony will prevail in the whole as well as in its parts.

The development of the artistic side of the engineering profession meets to some extent with difficulties which the architect does not experience. The latter has any amount of very excellent examples from ancient time; they form the very best guides for him and with their help his way to highest perfection is comparatively smooth. Not so with an engineer. There are very few examples of important engineering structures where the lines of beauty play such a prominent part; our way of construction has been changed so very remarkably that hardly anything now can be compared with the construction of ancient time.

Construction in steel and iron, for instance, has been developed to such a high degree of practicability, based upon such profound scientific principles, that the engineer of our days is in a position to solve most any problem, and yet how little attention is paid to the artistic effect of any of the more important structures, which are not always located in the midst of the wild prairie, but very often in the heart of our larger cities, and which are without question examples of the highest engineering

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skill, but which bear only too often testimony of a very poor and sometimes vulgar taste.

We very often hear the argument that those structures shall only answer the requirements of utility, any ornamentation or beauty being considered a waste of money and time. This seems to me a very short-sighted argument. Even a bridge, for instance, well designed and laid out with care and due attention to harmonious effects, will make a noble and pleasing impression, and does not generally cost more than a bridge simply constructed according to a strain sheet without the slightest attempt to produce pleasing proportions and harmony of details. Such a structure may call forth admiration for the bold designer, but will never appeal to our sense of the beautiful.

What is required to improve on our present designing of bridges and similar structures, in order to make these structures of most attractive character and artistic appearance, so that such a structure would be a precious treasure for the noble and beautiful surrounding, is, in the first place, that the designer takes the necessary care, love and thoughtfulness in working out a design in harmony with itself and its surroundings. Not too much time can be spent on a drawing board, if the designer is called to bring forth even in an engineering structure the fullest harmony and purest lines of beauty. It takes study to find out why certain ornamentation is wrong, or why a line of construction is just the right thing for the sake of beauty. It should be the duty of every student of engineering science to develop, besides his judgment for correct design, a taste for beauty in a structure. That personal gifts play a great part in this requirement is undoubtedly true, but in our day there are plenty of men of talent who never get a chance to develop these precious gifts and their sense of beauty is gradually dying away.

My endeavor has been to create structures in our Milwaukee Lake Park which are in full harmony with the beautiful and superb lay out of this park, which in time to come will be one of the handsomest in this country.

Not only has nature given us the most attractive and picturesque scenery along magnificent Lake Michigan, where beautiful ravines change with rich meadows, bordered with majestic groups of the finest species of forest trees, but careful and thoughtful landscape engineering has assisted nature in bringing forth the most magnificent park that can be found anywhere.

The first three bridges built during the years 1892 to 1894 are shown plainly in Figs. 1, 2 and 3. They are noble-looking structures, showing the greatest harmony in their proportions. The foot-bridge, Fig. 1, is not very richly decorated, but considering the limited amount available can be classified among the handsomest of its kind.

This bridge is composed of two 30-foot and one 50-foot plate girder deck spans; the girders are thirty inches back to back of angles; this depth was considered the most effective one with regard to graceful appearance. The girders are placed twelve feet nine inches center to center, leaving a walk of twelve feet clear between handsome iron railings; the bridge has two bents of ornamental cast iron columns well-braced. The abutments are made of well-bonded limestone masonry, with a very effective ornamental hand-railing of terra cotta on top of coping. The contem-

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plated flower vases and lamp-posts, as shown on the design, will greatly improve the appearance of this bridge.

The cost of this structure was as follows:

For the masonry and terra cotta railing	$1,398 45
For the iron work	1,274 00
Total	$2,672 45

My total estimate was $3,000.

The second bridge, Fig. 2, is a fifty-foot steel arch. This bridge carries the park driveway over a very picturesque ravine.

It is composed of six 50-foot steel arch ribs, very thoroughly braced; the front ribs are very effectively ornamented by a cast iron ornamental cover. The four inner ribs were figured for a live load of one hundred pounds per square foot plus the dead load. The floor was figured for the same load. In addition to same a ten-ton roller was assumed.

The roadway is twenty-six feet wide, resting on a floor support of I beams and buckled plates. The roadway is composed of about six inches concrete, on top of which are laid five-inch asphalt paving blocks. The sidewalks are seven feet wide resting on I beams, and are made of three-eighth inch cast iron plates with diamond face. A handsome handrailing thoroughly connected to the outside girder helps greatly to the pleasing effect this bridge produces.

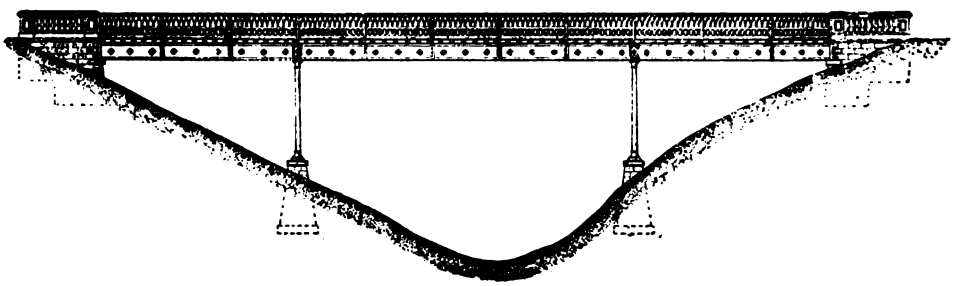

FIG. 1.

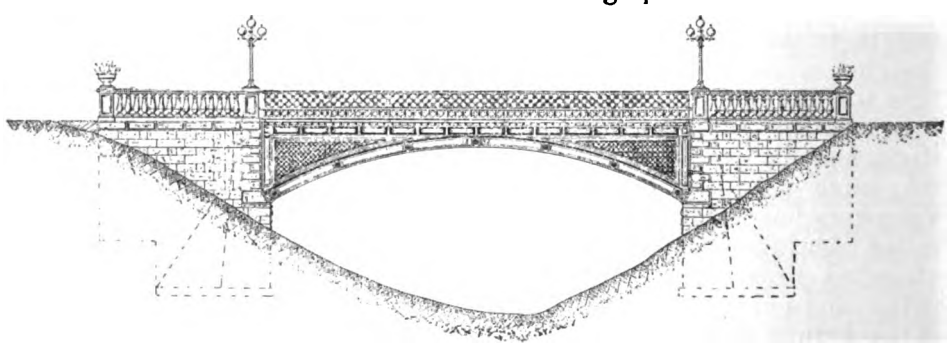

FIG. 2.

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flower vases and lamp-posts in their proper positions. The cost of this bridge was as follows:

Masonry and terra cotta	$5,786 00
Iron work	4,265 65
Roadway floor and sidewalk	769 83
	$10,821 48

Estimated cost was $11,200.

The third bridge, Fig. 3, is a thirty-five-foot brick arch over a very beautiful ravine. The ornamental parts of this arch were made of terra cotta, also the face stones of the arch proper. The arch is made of five rings best sewer brick, laid in Milwaukee cement. The face of the spandrel and wing walls were laid with handsome brown-face brick.

The sidewalks, six feet wide, are made of concrete, and the roadway, twenty-six feet wide, of macadam. A fine ornamental handrailing of terra cotta gives this structure an elegant finish. This bridge will also be greatly improved in general appearance as soon as the lamp-posts are in place. The total cost of this bridge, which was let in one contract, was $10,449. Estimated cost, $10,800. The most attractive and highly artistic of all the bridges in this park, however, are those located near the government light-house, crossing two of the most picturesque ravines, with a fine view over the magnificent bay of Milwaukee. These bridges form the main entrance to Lake park and are located in the most desirable residence property of the city of Milwaukee.

It was, therefore, very natural that these structures received the greatest care and attention as to proper harmony in their details. It required a great deal of study to give them the most attractive and artistic appearance, and I may add that only the desire to create something worthy of admiration by lovers of art was the principal motive that guided me in the design of these bridges.

After a careful investigation of the peculiarities of the location, with due consideration of economy and utility, I concluded that the most satisfactory solution of this problem would be the adoption of an arch bridge.

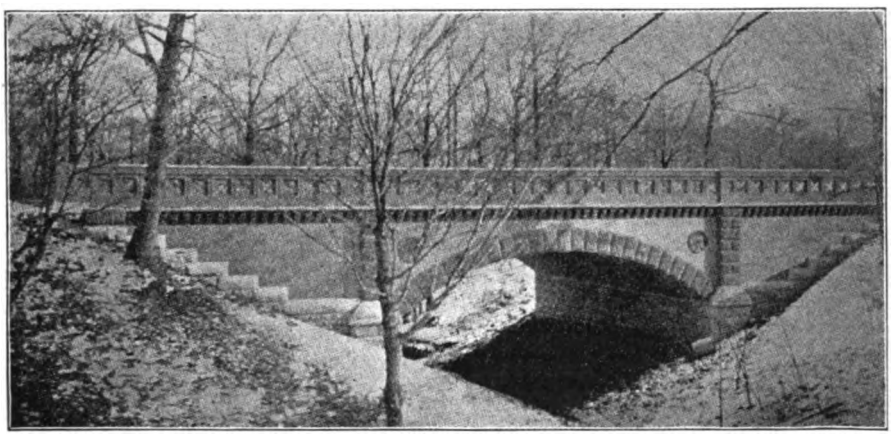

FIG. 3.

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LETTERS FOR THE PUBLIC.

THE SEWERAGE PROBLEM IN BALTIMORE.

To the Editor of Municipal Engineering:

Your editorial on Baltimore sewerage in the September number of MUNICIPAL ENGINEERING puts our situation here, generally, in its true light. It should be remembered, however, that the greater part of the domestic sewage, excepting that from privies, finds its outlet, as in Santiago, by way of the street gutters.

The present situation is this: After an elaborate study of the case, the sewerage commission reported last November recommending disposal by dilution in Chesapeake bay. This brought about so active an opposition from those interested in the oyster trade, through fear of damage to their business, if not of actual injury to the oyster, that it failed to secure the indorsement of a special council committee appointed to consider the matter. The same commission was, however, requested to continue its investigations and report on the best plan which would provide for the purification of the city's sewage.

This subject is now under consideration, and it is hoped that before long the commission will be able to submit a second report, which will not only meet with approval by our people, but will provide for purification at a not unreasonable cost.

The "harbor nuisance" has effectively, perhaps, than would any number of reports by engineers. As long as they have that horrible stench in their nostrils, the citizens realize that a screw is loose somewhere and, naturally, each man of an ingenious turn of mind sets forth his particular remedy.

It is true that, while ashes, night-soil and garbage are systematically removed, street washings, gutter drainage and occasionally vegetable refuse and dead animals find their way to the harbor. Nevertheless, the principal source of pollution is the discharge of private sewers and storm drains (which carry, as you have pointed out, domestic sewage) into a harbor in the very heart of the city, which is practically without the benefit of a current. The result in hot summer weather is, as might be supposed, a very offensive condition, which is noticeable at times throughout the business section of the city. So active are the processes of putrefaction carried on that the bay steamers painted white one day are as black in forty-eight hours, from the sulphuretted hydrogen evolved, as if they had passed through a fire.

On the whole, perhaps the situation is not without hope that before many more years have rolled

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THE CREOSOTED WOOD BLOCK PAVEMENTS IN GALVESTON AND INDIANAPOLIS.

To the Editor of Municipal Engineering:

Since the publication, in your last issue, of my article descriptive of the wood block pavements of Indianapolis, and also of Mr. Kenyon's reply thereto, I happened to pick up an issue of your magazine, dated April, 1895, and find therein an article from J. W. Byrnes, of Galveston, Texas. In this article Mr. Byrnes describes the wood pavements of Galveston, and from his description I beg to quote as follows:

"The method of paving here would not, of course, be applicable to other localities. The formation of this island is a pack sand. By flooding with water it can be packed so closely that a loaded vehicle will scarcely leave a track. After thoroughly saturating the ground, we surface the street with forms the contour of the street, and on this grade we lay the blocks closely, as is done with brick or asphalt blocks. The interstices are filled with close, clean and dry sand. The surface is rammed until the interstices are filled solidly with sand, and the surface smooth and even to conform to the contour of the street. The surface is then flooded with coal tar, liquified by heat to a sufficient degree to penetrate the sand joints, which is then followed by a second coating of paving cement, or thick mixture of asphaltum and dead oil. The surface is then covered with sharp sand and the pavement is complete. * * * Our blocks are cut from yellow pine, five inches thick, five and six inches deep, and from six to ten inches long. * * * The required amount of oil (creosote) for paving blocks is twelve pounds to the cubic foot."

Inasmuch as these blocks are of considerably different dimensions from those of the Indianapolis pavements, which are but four inches deep and wide, and as the foundation is entirely different, and as the interstices between the blocks of the Indianapolis pavements are not carefully rammed with a mixture of sand and tar, I submit that there can be no fair comparison made between the wood pavements of Galveston and those of Indianapolis. A wood pavement made of creosoted blocks after the Galveston method, and of such large blocks, might perhaps be a better one than those in Indianapolis.

It is probable that the sand base spoken of serves to conduct away the moisture which otherwise would accumulate in the blocks and produce results similar to those noted in the Indianapolis pavements.

F. A. Hetherington.

CONCRETE AGGREGATES.

To the Editor of Municipal Engineering:

The use of concrete for every kind of construction has become so general that the quality of the materials of which it is made is a matter of great importance. Specifications prepared for this purpose invariably call for broken stone, to the exclusion of other materials. I find that many persons, who have not given the subject proper consideration, contend that the com-

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pound is complete whereby stone, regardless of its quality or texture, enters into the mass. I will here state that as much care should be taken in the selection of the aggregates, stone and sand, as in that of cement. The stone should be perfectly clean and free from flour and dust. The fragments should possess angular faces and be graduated as to size. The theory that limestones contribute to the strength of the mortar with which they are mixed and ultimately produce stronger concretes, is incorrect. The limestone will invariably produce a concrete that can be termed as tough, but never attains extreme hardness, which is essential in all constructive work. I have also found that concretes prepared from limestone aggregates are much more liable to expansion than other stones. The irregular faces and sharp edges of broken stone are not all the advantages in the composition of concrete. It is essential that the aggregates should vary in size, so as to form a wedge with each other, and thereby permit of being properly compacted by ramming. Care should be taken to exclude long, thin fragments, which invariably crush under pressure or break in ramming the mass. The best concrete is obtained by using at least two sizes of broken stone, smaller than the largest aggregate. This fact can be readily demonstrated by mixing the stone and placing it in a heap, when the resistance to ramming will be apparent. The use of one size stone is liable to produce arching, even when the presumption is that the concrete has been properly rammed. When preparing concrete I have frequently used screened gravel with equal parts of broken stone. I have found its oval surfaces pack more closely in the interstices of the stone. To sum up the matter, a variety of shapes and sizes in the aggregates are essential for the ultimate strength of concrete.

I would therefore recommend that a percentage of the stone aggregates used in concrete be proportioned into at least two sizes, under the largest aggregate.

Warner H. Jenkins, C. E.

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THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

CHARGES OF DIFFERENT CITIES FOR FIRE HYDRANTS.

The recently adopted water rates of the city of Columbia make a charge of $30 per annum for each fire hydrant on private premises and three cents per sprinkler head of automatic sprinkler systems in addition to the meter rate. This charge is intended to cover the value of fire protection alone. Are our rates higher than the average? Can you give some actual figures?

Chas. C. Wilson, City Engineer
Columbia, S. C.

Two years ago MUNICIPAL ENGINEERING gathered a large amount of data regarding water-works, much of which has been published in various numbers of the magazine. From the unpublished portion the following information is taken:

Omaha pays $84 for the original hydrants and $60 for those since added.
Alpena pays $80 and $40.
Columbus, Ga., $80 and $75.
Elkhart, Ind., $75, $50 and $40.
Fort Worth, Tex., $100 and $50.
Memphis, Tenn., $80 and $50.
Leavenworth, Kan., $75.
Atchison, Kan., Ottumwa, Ia., and Hastings, Neb., $60.
Birmingham and Montgomery, Ala., pay $55.
Eau Claire, Wis., $54 and $44.
Cedar Rapids and Dubuque, Iowa, Superior, Wis., Kansas City, Kan., and Lexington, Ky., $50.
Topeka, Kan., $50 and $46.66.
Newark, O., $48 and $45.
Streator, Ill., $45 and $35.
Waco, Tex., $40, $35 and $30.
Akron, O., and Newburyport, Mass., $40.
Johnstown, Pa., $37.50.
Denver, Colo., $35.
Clinton, Hyde Park and Pittsfield, Mass., Kingston, N. Y., Nashua, N. H., Providence, and Woonsocket, R. I., $30.
Elizabeth, N. J., and Manchester, N. H., $25.
Burlington, Vt., Chicopee, Newton and Springfield, Mass., Hartford, Conn., Milwaukee, Wis., Pawtucket, R. I., $20.
Plainfield, N. J., $15.
Lowell, Mass., $12.
Mahanoy City, Pa., $10.

All these are for fire protection. It will be noted that the high prices are found in the west and south and the low prices are nearly all in the east.

Some of the works mentioned are of private ownership, but most of them are public works. For some the charge is that made to the city for fire protection and for others it is the charge for private fire hydrants.

The rate fixed by Columbia is a reasonable rate, judged by the standard of the table, and is much below the average rate. The main question arising is whether the city should charge anything for the hydrants, since they are for fire protection, which is usually considered as a general charge on the system to be paid from city funds or from the profits of the operation of the works. If the hydrants are placed on private property, and more or less removed from the direct inspection and control of the city, undoubtedly some charge should be made to cover the cost of laying and maintaining the pipe, and the cost of water used for other than fire purposes, if an additional charge is not made for fire protection also. A meter could be inserted to keep track of unauthorized use of water, provided a sealed bypass is put in, the seal to be broken and the gate opened in case of fire. If this is impossible some such rate as $30 will probably be found satisfactory. Local circumstances must determine the exact rate.

As regards automatic sprinklers the usage is still less uniform. Quincy, Ill., charges $50 to $200; Dubuque, Iowa, $100 to $150; Kansas City, Mo., $6 to $100; Kansas City, Kan., $5 to $75; Bay City, Mich., $15 to $50; Memphis, Tenn., $50; Kingston, N. Y., $30; Minneapolis, Minn., Newark and Plainfield, N. J., $25; Cedar Rapids, Iowa, $20; Baltimore, Md., and Hastings, Neb., charge meter rate;

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Columbus, Ga., and Moline, Ill., charge 5 cents for each sprinkler head. All the foregoing charges are per annum.

Burlington, Vt., requires only payment for the connection.

Eau Claire, Wis., and Nashua, N. H., make no charge if the owner of property is a regular consumer of water at contract rates.

Albany, Elmira, Rochester and Troy, N. Y.; Augusta, Ga.; Battle Creek, Grand Rapids and Detroit, Mich.; Des Moines, Iowa; Evansville, Ind.; La Crosse and Milwaukee, Wis.; Manchester, N. H.; Philadelphia and Reading, Pa.; Rockford and Streator, Ill.; Rutland, Vt.; Lowell, Newburyport, Newton, Salem, Springfield and Waltham, Mass.; Pawtucket, Providence and Woonsocket, R. I., make no charge.

A charge of 3 cents a sprinkler head is seen to be very reasonable in comparison with the prices given in the table and to be far below the average. The liability to waste and to unauthorized use of water makes good rates desirable unless meter is used. The meter is only possible if pressure after passage through the meter is ample for sprinkler purposes.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

PAYING FOR PAVEMENTS ON TEN-YEAR PLAN IN INDIANA.

A few cities in New Jersey have a five and ten-year plan for paying for pavements, but a gentleman said Indiana cities had a special system, but referred me to you for the details. Will you please tell me that system of collecting assessments?
W. J. Newhill, Jersey City.

When the board of public works or proper authority have allowed the final estimate of cost of a piece of pavement, the property-owners must begin their ten equal annual payments, either on November first, or the third Monday in April following the date of the final estimate, according as the estimate is made, between October 1 and March 15, or during the other half of the year. Every six months, after the payment of the first one-tenth of the cost and accrued interest, there falls due, alternately, the interest for six months on the unpaid part of the cost and another tenth of the cost, with six months interest. Thus, in the middle of each year, interest only is paid, and once each year interest and principal are paid. The rate of interest is 6 per cent. A person can anticipate all the payments by giving notice.

The city finance department can issue paving bonds for each improved street and use them to pay for the work in advance of the collection of the assessment. The system makes an excellent ten-year payment plan, as well as providing for any less number of payments a property-owner may elect. This Indiana law, known as the Barrett law, is well worth the attention of the cities of other states.

ROMAN ROADS AND THE APPIAN WAY—HOW MADE.

Writers on roads often refer to the Appian Way and to Roman roads, but do not describe how they were constructed. Where was the Appian Way and how were the Roman roads constructed?
Charles Lyman Leighton, Evanston, Ill.

The Via Appia was begun 312 years B. C. by order of Appias Claudius Cæcus. He planned to have it run from Rome to Brundusium, at the southeastern point of Italy (modern Brindisi), 350 miles away. He finished it to Capua, near Naples. It was not finished to Brundusium until more than 200 years later. It was very important because it was the great artery of

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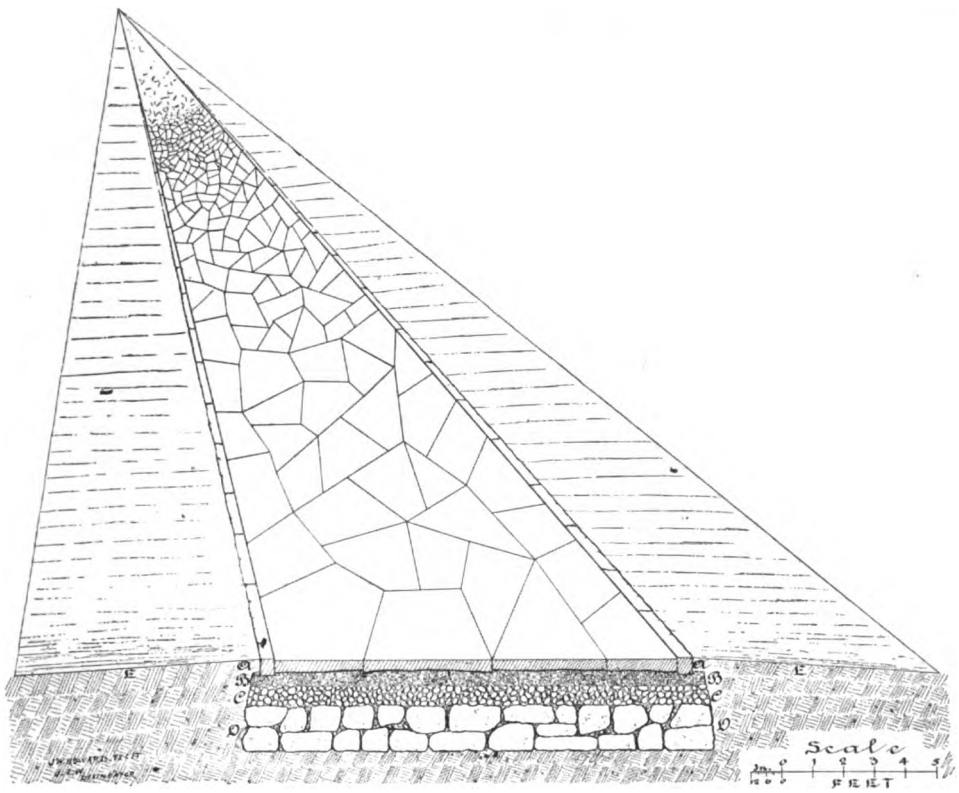
travel, commerce and the passage of military forces to Greece, Asia Minor and the Orient. Many portions of the Appian road, as well as other Roman roads in different parts of Europe, are still in use or are used as foundations for modern roads.

The general method of construction of these great roads running from Rome to the uttermost parts of her empire in Europe, but not in



Asia and Africa, was as follows, and as shown in the drawing:

The road was laid out as straight as possible, often too straight, resulting in a few excessive gradients. The soil was removed for about three feet in depth, unless a solid rock bottom was reached at less depth. Except where a rock bottom was found, the road was made of four layers, of a total thickness of three feet. The lowest layer, D–D, about 18 inches thick, was composed of two or more courses of large stones, usually laid in cement mortar. This layer was omitted if solid rock was encountered. The second layer, C–C, about 8 inches thick, was a concrete of various mixed sizes of stones and mortar. The third layer, B–B, about four inches thick, was a well-mixed concrete of small stones and mortar. The fourth layer, or pavement, A–A, was made by fitting together large, even-surfaced slabs of hard stones, of irreglar polygonal forms. Their lower surfaces were parallel, or nearly so, to the upper. The sizes were from several feet across to a few inches, for all were cut to fit closely together, like an enormous mosaic. This fourth layer was laid on the third layer

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before the latter was dry, and thus each stone was solidly imbedded. Sometimes the surface of the road was not paved, but simply finished with a fine pebble and cement concrete. At the sides, there were earth walks, about 8 feet wide, for foot traffic in pleasant weather. These sloped outwards.

Some Roman roads are found where clay was used in one or more of the layers, instead of mortar. The width of the paved roadway was about fourteen feet. It is not strange that the foundations of such roads have lasted for two thousand years and are still in use. The paved surfaces become too rough and worn for modern use, and where the old Roman roads are still used, the stone slabs have been superseded by modern macadam surfaces, well laid and well maintained upon the everlasting Roman foundations.

MECHANICAL FILTERS AND SAND FILTRATION.

Is the mechanical filter a success both in filtration and cheapness of maintenance? Are they preferred to sand filters?

T. D. Wheelock, Superintendent Water-Works, Moline, Ill.

The many experiments that have been made recently upon the filtration of water by the two methods mentioned have practically demonstrated that local conditions will determine which method is the better in a particular place when both the results of the filtration and the cost are considered. pumped twice, as may be necessary for the former, or but once as may be possible for the latter, even when pumping under the direct pressure system, must be considered. The degree of purification necessary, and the character of the pollution or sediment which must be removed, including the consideration of sedimentation, are also important questions. It is possible to do equally good work by both systems if the apparatus is properly managed and cleaned, and the mechanical filters are not run too rapidly. It is possible to do equally poor work by both systems if the work is neglected.

The sanitary and engineering questions must both be considered by expert engineers at the same time as the cost, and for the local circumstances, so that it is impossible to say which system will give the best and cheapest results on the whole until a detailed study of the particular case is made. Do not waste money by employing a cheap engineer. A few dollars saved at the beginning frequently means many dollars wasted in construction, in maintenance, or in inconvenience of operation.

SCALE ON DRAWINGS REPRODUCED BY PHOTOGRAPHY.

We have difficulty in getting our drawings reproduced so that when reduced by a photo-process the reduced measurements will correspond exactly to the numbers showing the scale of the reductions. As MUNICIPAL ENGINEERING often prints cuts to scale, kindly state how you accomplish

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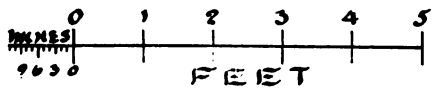
by tracing and blue-printing. The best way is to draw an actual scale upon the plan, drawing or map. Such a scale is most convenient if made from a zero point by units, inches, feet, miles, to the right of zero and numbered 1, 2, 3, etc. Then place one of these units to the left of zero and subdivide that into whatever number of parts the unit used is usually divided, as ten, twelve, etc., and number these. The figure shows the system:



Such a scale in a drawing will be reduced with the drawing and remain true. Moreover, as blue and other wet printing processes shrink from the original sizes when dry, such a scale shrinks with the drawing and remains correct. In fact paper drawings themselves change with the weather, and a scale drawn upon them is better than one expressed by numbers. The scale is best used by using a strip of paper or the dividers, and at one measurement include the feet to the right and the inches to the left, or whatever the units and its subdivisions may be.

BY WAY OF COMMENT.

Action of Concrete on Lead Pipe. In making connections and in carrying lead pipes through foundations, it is sometimes very convenient to set them in cement or surround them with mortar. Experiments have shown that this practice is unsafe, for the lime and cement, while different in action, both destroy the pipe. A water pipe will burst, thus showing the location of the weak spot, but gas may escape through openings thus made for a long time before the discovery of the defect is made. Lead pipe in such places should be protected by surrounding it with a stoneware pipe or drain tile, or with asphalt.

Combination Water and Electric Light Plants. Why are combinations of water and electric light plants in our smaller cities not more numerous? In this class of municipalities neither plant is run to its full capacity, and the lighting plant in particular is idle a large part of the day or is run at a very small percentage of the possible output.

Where both plants are owned by the city the combination is easily made. If reservoir or tank capacity is supplied, the same boilers will answer for both engines, as the pumps can be run when the dynamos are idle. The coal bill will be greater than for the single station, but it will be much less than that for the two stations. One set of firemen and engineers may be discharged. Repairs, attendance, buildings, coal, will all be reduced materially. The only thing which may possibly be increased is storage capacity for water.

When the city owns the electric-light plant and does not own the water plant, a combination is less

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readily made, and the same is true if the city owns the water-works and the company owns the electric-light plant.

If it is necessary to run the light plant all the time for a few power customers, a low rate might be made to the water-works to use electric motors, provided they would use their pumps when other power on the line was light. Much can be saved in this case, the only loss from the first case being in the transmission of the power through the electric current. The city should reap a part of the benefit of such an arrangement.

In some cases a combination can be arranged between two companies owning the two plants, if the city is clear-sighted enough to require it in the franchises, but such an arrangement will be thoroughly satisfactory only when one company holds both franchises, and the city is likely to get but little benefit from the economy, unless it is more than usually acute in making its contracts.

The Air-Lift for Deep Wells.

Several quite successful plants for raising water by the air-lift have now been installed and, while the details of the method have not yet been fully worked out, it has been demonstrated that in some circumstances it is preferable to the use of pumps. It is undoubtedly true that the air-lift is much less efficient than the pump, when considered from the side of consumption of steam, but there are other considerations and there are details of practice which offset this difference in some degree. The deep well pump has moving parts which are far out of sight and must be withdrawn for frequent repair, while the air-lift has no moving parts and needs few repairs if properly designed and constructed. An absolutely straight well is not demanded for the air-lift. It seems to be able to draw a larger supply from the same well than the pump, thus saving in first cost of the well. On the other hand, if the water is found far below the surface, the well must be made much deeper than necessary to reach the water with a pump, or the well must be large enough to permit of more than one lift, so that the depth at which the air-lift can be constructed for economical first cost is limited. Though some of its advocates are ready to claim everything, it is not probable that the air-lift can be used economically to raise water above the surface to a reservoir or tank. Part of the action of the bubbles of air is that of a piston, or of the bucket of a chain pump, which does not completely fill the tube, and therefore permits a large amount of slip. This is not offset by the reduction in density of the column, caused by the mixture of the expanding air with the water. Unless the quantity is very small or the production of other power or attendance is particularly difficult, that portion of the lift above the surface will generally be made by a pump rather than by the air-lift.

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The possibilities of the air-lift are not by any means exhausted, and many improvements are in progress. The relative efficiency of the air-lift and a deep well pump, in a recent test, were 18 and 75 per cent. Under unfavorable circumstances the difference might be even more than this, but in the cases to which the air-lift is best adapted the difference will be less, and no small part of this difference will be offset by economies outside that of steam.

In small plants, where quantity is desired at low first cost, and the difference in cost of operation is small in fact, though large in percentage, the air-lift will be largely used. As knowledge of principles and of method of application of details increases, the field in which it can be used will be extended.

One valuable action of the air is to aerate the water so that odors due to minerals in solution disappear, and iron salts, in solution are rendered insoluble and can be removed in a settling tank or reservoir. This method of lifting water might be best, therefore, for such a case as Richmond, Mo. (see page 161, September), if a settling tank is provided.

Ownership of Street Railway Tracks.

In a discussion on municipal ownership of street railways, a division of the subject into three or four parts must be made. The road-bed or permanent way is fixed in position and usually a part of the roadway of a street; the cars and horses or motors are public vehicles differing little from other vehicles so far as the principles of their regulation are concerned; in electric and cable systems there are in addition the overhead wires, conduits, cable and such appliances, taking space in, over or under the street. The structures on private property, such as stables and power houses, are additional appurtenances which may be added to these or put in a class by themselves.

There is a general sentiment that street railways should not be owned by the city. If the vehicles alone are considered, without reference to what they run on, the principle that only public utilities which are natural monopolies should be owned by the city, definitely demands private ownership.

Were it feasible to run private vehicles on the rails, there would be still less question of monopoly in connection with the vehicles. If the rails and road-bed are considered to be a portion of the pavement, as they undoubtedly may be, their construction and ownership pertain to the city, exactly as that of the rest of the pavement does. With this view of the case disappears nearly every trace of natural monopoly. Public convenience demands restriction of ownership of cars to very few owners under careful regulation, but this ownership can be determined by the method of public bidding at definite intervals.

This argument for municipal ownership of the permanent way, and for its lease to private individ-

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uals or corporations for operation, is very plausible and offers a solution to the theoretical difficulties. The stables, power-houses, systems of wires and other appliances necessary to run the cars belong theoretically with the cars, and all should belong to the lessee of the road. Practically, the expense of furnishing them is so great and the difficulty of transferring them to a new lessee of the road-bed is so serious that they must nearly all be considered as appurtenances of the road rather than personal property of the lessee, and so must be the property of the city. The question of maintenance and repairs is a troublesome one and the proper distribution of the expense between lessee and city is difficult. Improvement in the system is less likely to occur than when a single owner is interested, unless the contract is very liberal.

This method of dividing the responsibilities obviates most of the theoretical difficulties of entire municipal ownership, and really gives little or no more opportunity for political manipulation by the corporation than private ownership. These advantages are offset to some extent by the probable conservatism in the line of improvements.

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favorable verdicts for the plaintiffs in such suits, but as the cases of damage became more numerous, and those where the negligence of the city was obvious were developed, the courts were obliged to consider the facts in detail, and have made equitable decisions holding the cities responsible for the results of their negligence and of their failures to provide themselves with competent engineering assistance. Some years ago, before so many cases had come to trial, an Indiana city was compelled to pay large damages for a failure to make the gutters and inlets leading to the sewers large enough to carry the water naturally reaching them in a storm of somewhat more than average rainfall. The tendency in later decisions is to hold the city responsible for the damage if frequent indications of inadequacy of sewers have been observed and the storm is not so far beyond the usual that it may be considered to be out of the reach of reasonable precautions. If, however, the city is unable to do at once all the work of this sort required, on account of lack of funds, it has the privilege of choice, and if an amount deemed reasonable by the court is expended somewhere in the city, damage in some other part of the city must be borne,

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One lesson to be learned by the cities is to secure competent advice in preparing plans for drainage and sewerage systems, that the city may make valid claim of exercising due diligence. The margin for decision for or against the city on this point is small. Many more cities would find themselves assessed for damage for such causes if the possible plaintiffs were not equally ignorant of their rights in the case. Very few attorneys are adequately informed and these are not of the class who travel about seeking damage cases, but the number is slowly increasing. The city which puts its house in order at once is in the best position to set up a successful defense when damage from excessive rainfall actually occurs.

Appeals to expert engineers in such suits are becoming more frequent. In the past the decision as to what is a rainfall to be reasonably expected and taken care of has rested on the average of unscientific observations by untrained observers not particularly interested and with no technical knowledge. The addition of competent engineers to the cases makes them all the worse for the cities, and the proportion of cases where verdicts for damages are secured is increasing.

The Cornwall Bridge Failure.

Little is yet known of the reasons for the collapse of two spans of the new bridge of the New York and Ottawa railroad over the St. Lawrence river at Cornwall, Ontario. The two spans were nearly completed, and a number of men were carried down with them, fifteen being killed and sixteen injured. The bridge is located near the foot of the Long Sault Rapids—where the current is very rapid—eight miles an hour. Witnesses of the accident consider the cause of the accident to be the washing away of the pier, carrying an end of each span.

The plans of the bridge were made under the direction of the chief engineer of the company and approved by its consulting engineer and by the engineer of the Canadian government. The piers were built by Sooysmith & Co., and the superstructure by the Phœnix Bridge Company, both well known for the large and exceptionally difficult contracts they have carried to successful completion.

In the absence of definite information of the present condition of the foundation of the pier, and in view of the known difficulty of determining the exact condition of the bottom at all times during construction, owing to the rapid current, it may be assumed that sufficient allowance was not made for the effect of the rapid current. Reports differ as to whether the foundation was hard pan or solid rock. If it was hard pan or rock which the swift current could disintegrate, the accident may be due to undermining, and this is at present the most plausible explanation.

The depth of the water is nearly forty feet, and the first thirty-five feet or so of the pier was built of

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concrete, filled into the crib which was sunk on the prepared foundation. This portion of the pier was completed nearly a year ago, and was apparently in good condition when the upper portion, of stone, was begun last spring. Did the swift current disintegrate the concrete partly in the process of depositing it, making it easier to complete the work later when some accident removed a part of the protecting timber crib? It was subject to several severe shocks from ice and timber rafts during the winter and spring. Perhaps the cement did not set in the pier below the surface. In so rapid a current a slight cause at the beginning would permit rapid development of the defect and account for the sudden failure without any warning.

College of Forestry. New York is the first state to recognize the value of expert knowledge of forestry to the extent of establishing a school where the subject can be properly studied. Such a department has just been opened at Cornell University and the state has turned over its 30,000 acres of forest land as a field for the practical application of the theories worked out in the class-room.

There are two classes of lands upon which forests will be cultivated when this country wakes up to the necessity of replacing the virgin forests now disappearing so rapidly under the axe of the lumberman. One is the waste lands, mountainous or otherwise, such as the Adirondack wilderness in New York, the pine barrens of Michigan and Wisconsin, the mountainous regions of the west. This class of lands was formerly covered with a dense growth of timber. New York is trying to preserve the remnant of the timber not yet taken off and has purchased the vast tracts mentioned, located in the Adirondacks and the Catskills. The denuded portions it will be difficult and in some cases impossible again to cover with timber.

The other class of lands will be the fields which are more or less valuable for purposes of tillage, in the more level states, including the great prairie states. Here there is now a tendency to reserve or to cultivate a "wood lot." on every farm of appreciable size. This lot is frequently on the less valuable, the least workable, part of the farm, and is fairly permanent, even under present conditions. In fact, in the prairie states there is an increase in the wooded area with the increase in settlement. None of the farmers and very few of the large land-owners have any knowledge of the subject of forestry, and fail to make the most of their work. None of them have yet discovered the fact that the wood-lot may be made the most valuable portion of the farm if it is rightly managed and the necessary time is allowed it. Our American hurry to get results is against a scientific cultivation of forests, either on a large scale or on individual farms, and it

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will probably be necessary for the stable government to take in hand the work which men of comparatively short lives are not disposed to enter upon.

Other agricultural schools having similar facilities will doubtless follow the lead of Cornell and establish schools for the study of the problems which will arise in their own states. The next twenty years will see a large advance in public opinion and a good start made towards a comprehensive and practical system of forestry in this country.

American Society of Municipal Improvements.

The officers and committee chairmen of the American Society of Municipal Improvements have done much to insure a successful meeting this year at Washington. An interesting programme has been arranged, and the subjects to be discussed by some of the ablest writers of the country insure a profitable occasion for those in attendance. Our national capital has at all times many attractions for strangers, and this year has an added interest by reason of the late war with Spain which has concentrated so much attention upon the official portion of the city's make-up. The programme of the meeting will be found elsewhere. The convention will be held October 26–28.

Clay and Asphalt Production in United States.

The United States Geological Survey has issued a report of the mineral products of the United States by years from 1888 to 1897 inclusive. It shows the following production of the articles named:

Year.	Brick Clay.	Asphaltum.	
	Value.	Short Tons.	Value.
1888	$7,500,000	53,800	$331,500
1889	8,000,000	51,735	171,537
1890	8,500,000	40,845	190,816
1891	9,000,000	45,054	242,264
1892	9,000,000	87,680	445,375
1893	9,000,000	47,779	372,232
1894	9,000,000	60,570	358,400
1895	9,000,000	68,163	348,281
1896	9,000,000	80,503	577,563
1897	8,000,000	75,945	664,632

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PERSONAL INFORMATION.

Ericson—Mayor Harrison on July 6, 1897, appointed John Ericson city engineer of Chicago. A few days later Mr. Ericson successfully passed the needful civil service examination, he being the only one of ten competitors who did so. Mr. Ericson brought to the important office he was thus qualified to fill the results of long practical training and experience. Born in Sweden October 21, 1858, he received a common school and collegiate education at his home, later graduating from the Royal Polytechnic Institute, Stockholm. Immediately thereafter, in 1880, he was appointed assistant engineer of the Vasa Bridge, Stockholm, which position he retained for one year, when he removed to America. Arriving here, he was made resident engineer of the Toledo, Cincinnati & St. Louis railroad, and the following year accepted a position as bridge designer with Hopkins & Co. of St. Louis. From 1882 to 1884 he was assistant engineer on the Illinois and Mississippi canal. In the last named year he entered the city of Chicago as draughtsman, which position he filled with such fidelity and ability that he was, in 1886, promoted to the position of city engineer, the position which he now holds.

JOHN ERICSON

During Mr. Ericson's employment by the city of Chicago he superintended the construction of many important and monumental public works in that city and elsewhere.

He was in local charge of the Lake View, North Shore and Sixty-eighth-st. tunnels. He was also assistant chief engineer for the location and design of the new water works at Seattle, Washington. During his service as assistant city engineer Mr. Ericson was in charge of all tunnel and crib construction and made the plans and specifications for twelve miles of new tunnels, together with two new pumping stations, each station to have four twenty-million gallon triple expansion pumping engines. All this extensive addition to the water works system is now in course of construction, and in addition there have just been completed one thirty-million triple expansion engine at the Fourteenth-st. pumping station, and one fourteen-million compound engine at the Sixty-eighth-st. pumping station. There is also being laid at present 35,000 tons of large water mains to serve as feeders in connection with the new engines. Mr. Ericson has also overhauled all the engines of the various pumping stations, entailing a vast amount of detail work. All the extensive improvements to the water works system of Chicago have called for engineering and executive ability of the highest order, and Mr. Ericson has amply met the expectations of the citizens as well as of the administration.

As an engineer Mr. Ericson stands in the foremost rank. In all the public positions which he has held he has given eminent satisfaction and many of his works stand as monuments to his engineering skill.

He is a member of the Western Society of Engineers, Chicago Academy of Sciences and of the American Society of Swedish Engineers. He has traveled extensively through Sweden, Norway, Germany, Holland, England, Scotland and the United States.

Cappelen—One of the prominent figures at the gatherings of the American Society of Municipal Improvements is F. W. Cappelen, city engineer of Minneapolis, Minn. Mr. Cappelen has been closely identified with the organization since its inception and has contributed much valuable information through papers presented and discussions on many topics of interest. In some respects there is a striking parallel in his history to that

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way; both celebrate their birthday on the 21st of the present month, Mr. Cappelen being born in 1857 and Mr. Ericson in 1858. They both removed to America about the same time and both sought and found high

F. W. CAPPELEN.

professional distinction in the great northwest, where so many of their countrymen have won like fame and fortune. Mr. Cappelen entered school at the age of five years and graduated from the Norwegian institute (similar to our high school) nine years later. Three more years were spent in the Technical institute and mining school at Orebro-Sweden, from which he graduated and entered upon a four years' course in the Royal polytechnic institute at Dresden, Germany. From this institution he graduated as a civil engineer with high honors in the year 1880. During the last seven years of this period of preparation and study he was engaged from time to time in government surveys and railway work in Norway and Germany. He was next transferred to Minneapolis as assistant engineer and bridge engineer with the St. Paul & Northern Pacific company. In 1887 he severed his connection with the Northern Pacific company to become bridge engineer of the city of Minneapolis. In this position not only the bridge work but most of the heavy construction of the rapidly growing and expanding city was in his charge. On Jan. 1, 1893, he was elected city engineer, which position he still retains. The office is one of great responsibility, he having full charge of all departments except parks. Mr. Cappelen is the possessor of talents of a very high order, and these, coupled with a thorough course of study and training and experience, have enabled him to meet all the requirements of his exacting position in a manner that does great credit to himself and the city in whose service he is engaged.

Beach—The chairman of the committee on sewerage and sanitation of the American Society of Municipal Improvements is Capt. Lansing H. Beach, engineer commissioner of the District of Columbia. One of Capt. Beach's most striking characteristics is a

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1860 and graduated from the West Point military academy in 1882, standing third in his class. He has performed engineer duties at Willet's Point, N. Y.; Galveston, Tex., and Cincinnati, O., besides being secretary of the joint commission to determine the boundary between Texas and the Indian territory. From Cincinnati Capt. Beach went to West Point, where he was instructor in civil and military engineering until the fall of 1893. He then went to Galveston for harbor work, and in the fall of 1894 was detailed as an assistant to the engineer commissioner of the District, performing such duties until June 30 last, when he succeeded Col. William M. Black as engineer commissioner.

Mr. Moncure Burke is Capt. Beach's secretary. Mr. Burke is a native of Virginia. He was educated in the public and private schools and took a scientific course at the Corcoran scientific school of Washington, D. C. He was with the Southern Railroad company until 1891, when he became the secretary of Col. Henry M. Robert, the then engineer commissioner, and he has filled that position with every succeeding engineer commissioner.

Van Bergen—On Sept. 9 Mr. C. E. Van Bergen, manager of the Duluth light and water plant, presented his resignation to the board, which accepted it. The resignation took effect Oct. 1. It is understood that the resignation is the outgrowth of the long contest between private and municipal ownership of the water plant, and not of any question as to Mr. Van Bergen's capability as a manager. His previous connection with the owners of the private plant and his outspoken opposition to municipal ownership made a situation which the commissioners and Mr. Van Bergen felt was of so embarrassing a nature that the change was necessary. Mr. Van Bergen had previously tendered his resignation, but the board at that time would not accept it.

CURRENT INFORMATION.

Meeting of the American Society of Municipal Improvements.

At Washington, D.. C., Wednesday, Thursday and Friday, Oct. 26, 27 and 28, in the banquet hall of the Arlington hotel, will be held the fifth annual convention of the American Society of Municipal Improvements.

D. L. FULTON.
Secretary A. S. M. I.

The convention will be opened by an address of welcome by Commissioner Ross, president of the board of commissioners of the District of Columbia, upon the "Utilization of Sewage of Vienna." This paper is a translation of the report upon the subject by the commission appointed by the Austrian government to make a thorough study of the question, and the translation has been made, with comments thereon, by Capt. Beach.

A paper will be given upon "Tree Planting in the Streets of Washington" by William P. Richards, asisstant engineer, engineer department, Washington. Mr. Richards will also contribute a paper upon "A Street Extension Plan for the Entire District of Columbia."

"Proposed Sewage Disposal for Washington, D. C.," will be treated in a paper by D. E. McComb, superintendent of sewers, District of Columbia. The first day's outline also includes the appointment of a committee an officers for the ensuing year and on choice of city for the next meeting.

Thursday morning will be devoted to a visit to the public buildings, including the capitol, new library building and the Smithsonian institute.

Thursday afternoon at 2 o'clock the report of the committee on street paving will

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"The Selection of Paving Material," by George W. Tillson, C. E., of Brooklyn, N. Y.; "The Proper Regulating of Curbing and Streets," by Horace Andrews, city engineer, Albany, N. Y.; "The Cost of Repairs to Asphalt Pavements in Buffalo," by E. B. Guthrie, late chief engineer Board of Public Works, Buffalo, at present engineer to the grade crossing commisison. The election of officers, selection of location of next meeting and other committee reports will conclude Thursday's exercises.

On Friday will be given a paper by Harold P. Brown, electrical engineer of New York upon "Electrolysis Tests at Dayton, O.;" and a paper upon "Electrolysis in Davenport, Ia.," by the electrician of that city. The committee on municipal data, Charles C. Brown, C. E., chairman, is preparing a report of special interest, in which will be set out special forms for reports of cities, so that definite information may

J. L. KENNEDY,
Treasurer A. S. M. I.

more readily be obtained from these reports. It is hoped that the special forms of reports may be recommended to the proper authorities as a basis for the statisticial tables on municipal work of the next census.

George H. Benzenberg, C. E., of Milwaukee, Wis., chairman of the committee on review, will submit the report of his committee. The work of the convention will probably be followed by an excursion down the Potomac to Mt. Vernon and other points of interest. Taken as a whole the meeting promises to be one of great profit. The society's officers at present are:

President—Harrison Van Duyne, C. E., Newark, N. J.

First Vice President—L. W. Rundlett, C. E., St. Paul, Minn.

Second Vice-President—E. H. Keating, Esq., Toronto, Ont.

Third Vice-President—A. D. Thompson, C. E., Peoria, Ill.

Secretary—D. L. Fulton, Esq., Allegheny, Pa.

Treasurer—J. L. Kennedy, Esq., Nashville, Tenn.

An Appeal to Detroit Merchants.

Mr. D. W. H. Moreland, president of the Board of Public Works, Detroit, is out with a little circular which evidently undertakes to do by persuasion what the more forcible mandates of the law have failed to accomplish. It will be of interest to officials of other cities who have tried a fall or two with the same problem. It is headed

Detroit The Beautiful,

and asks that the business men of the city desist from an unbeautiful custom. It inquires "Will the business men of the city help the Board of Public Works to keep the city clean?" After stating that many citizens are heartily co-operating with the board in its efforts, it says: "On the other hand, a number of business men continue to have swept and thrown into the streets much of the refuse which accumulates in their places of business. In the early morning a bushel basket full of stuff is swept across the sidewalk into the street from half a hundred stores within the quarter mile circle. This is a violation of the city ordinance and at the same time retards us in our work of keeping the streets in the shape we believe they ought to be." Mr. Moreland's appeal may touch the heart of a chance offender, but we doubt it. A merchant who insists on dumping his accumulated refuse on streets as spotless as those of Detroit usually are, will be apt to turn a deaf ear to anything short of the announcement of a heavy penalty for his misconduct.

New Sanitary Regulations in New York

The special committee appointed by the board of health to investigate the collection and disposal of the garbage of New York City has made a report in which it recommends that the sanitary code be amended so as to compel the removal of garbage from the city every twelve hours to the place of disposal; to prevent any boat or barge used in the removal of garbage from being tied up at any city pier longer than twelve hours at a time; to have these boats covered so as to prevent the escape of bad smells; to provide that garbage must be deodorized. Also that the windows, doors and skylights in the buildings on Barren island be kept closed at all times and that necessary air be forced in by fans and drawn out by pumps, duplicate sets of the

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latter being required, so that the breaking of any would not require the opening of the windows. The report was unanimously adopted by the board and the corporation counsel was directed to amend the sanitary code to cover these recommendations. President Murphy was also empowered to revoke the permits of companies on Barren island who do not immediately comply with the new rules. The special committee consisted of Dr. G. W. Martin and Dr. James B. Taylor.

National Road Parliament.

Notice has been issued by Martin Dodge, director of office of road inquiry, U. S. department of agriculture, Washington, that on October 8, at 10 a. m., the National Road Parliament will convene in the auditorium on the grounds of the Transmississippi exposition at Omaha. The objects of the meeting are to awaken and promote a general interest in the improvement of public roads, discuss the best methods of building and maintaining them and to promote good road legislation. The governors of the various states, as well as state and local road improvement associations are requested to send representatives and all other public bodies concerned in the subject as well as all active private friends of the good roads movement are urged to attend.

Should Meter Reading Be Taught in the Schools?

"Should gas and electric meter reading be taught in public schools?" is a question that was discussed at a recent meeting of the Pacific Coast Gas association. The discussion was as follows:

The Secretary—It appears that the question has been discussed in some of the eastern associations, and that one of the foreign journals devoted to the gas industry printed a column editorial on the question of the advisability of teaching meter reading in the public schools. I am a convert to the belief that it should be taught in the public schools. Heretofore, no matter what means he may have employed, the gas man has not been enabled to teach his consumers how to read a meter. I have grown gray in that attempt, and expect all of you have encountered a like unwillingness. They never will understand it; they don't want to; they don't care to. It seems to me that such knowledge should be spread, for the protection of both gas and electric light men, for electric meters are now coming into vogue prominently, and I do not see any reason why everybody should not be taught to read his meter. If the consumers would read their meters the life of the complaint clerk at the counter would be materially happier than now, and there would be better satisfaction in the matter of gas bills besides, because you can convince reasoning men, if you talk to them in your office of the ability of the gas meter to register honestly; but you cannot always prove to them, by the reading of a meter, after the meter has been taken three or four weeks, when they think of making a complaint, that the record then read so and so. In this matter we have adopted a system in our office that I find beneficial, which is a notification by postal card to every consumer of the statement of his meter when originally set; and, if it is changed, of the change of the meter. I find it is very satisfactory. They can keep track of it in that way. However, that is outside of this question. In the higher grades of the grammar school, or in any high school class, this could be made a subject for discussion once a month. Practical lessons could be given to the children, or to the young men and young women, as to the construction of the meter. Every gas company would be very glad to give to each high school in its place a meter for instruction purposes, and with a knowledge of its construction and operation the simple, easy and successful working of the meter would be in time familiarized among the people. That is my response to the question.

Mr. Parker—The introduction of the prepayment meter would seem to solve this problem so far as the gas end of it is concerned. I don't believe there are three people in Napa who can read their meters; in fact, many of them don't know what the price of gas is. Their only thought is, "How much is the bill?" Wherever we introduced the prepayment meter we have not a kicker on the line. At first we put those meters in for troublesome customers. In some cases where, with the ordinary meters, they grumbled at paying $4 a week they now pay with the prepayment meter $8 a week, without a word of complaint. I think the prepayment meter has been quite a boon to gas men, and in its use we find very little trouble. In cases where safe paying consumers find fault with the ordinary meter, we have adopted for their instruction and pacification a system followed by Mr. Clements at Red Bluff. Small blanks showing dials of meters without any index pointers are given to boys to collect statements. They simply take the statements and mark on the diagram the position of the hands. These are brought to the office and the bill is made out. If there is any subsequent trouble about the statement, this diagram is produced generally to the satisfaction of the consumer. I am opposed to the idea of cram-

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ming the already over-crammed pupils of the high schools.

Mr. Petch—Notwithstanding the prepayment proposition I believe it will be quite a while before the companies use exclusively the prepayment meter. In my experience the few consumers whom I have been able to persuade to learn to read their own meter have invariably been those with whom I have never had any trouble. It made no difference how large or how small their bills were before we sent our collector, they knew what their bills would be and were ready for us. I fully agree with Mr. Britton that it would be a good thing if all our public school children were taught to read meters. It would not take very long to accomplish this object, and the result would be of incalculable benefit to gas companies in the number of kicks given and complaints made. We tried the Clements' plan, but after a while, however, we discarded it. It would do for a few meters, but when you get quite a large number of these diagrams on your hands it is hard work to keep track of them. One way or another we got losses, no matter what care we took in filling the stub. In fact, we put them on both the bill and the stub (on the bill on one side and on the stub on the other) so they could see for themselves the position of the hand on the bill, and then examine the meter to see if the accounts were correct. At the same time, after quite a while had elapsed, to the time the complaint was made, we often failed to find the particular record desired, and this failure seemed to cause stronger suspicion. On the whole, I believe it would be a good thing to have meter reading taught in the public schools.

Ravages of Electrolysis in Dayton.

An investigation of the water pipes, gas pipes and other underground systems at Dayton, O., develops the fact that fully nine miles of water pipes have been so seriously affected by electrolysis that a calamity is liable to ensue at any moment from a bursting of the damaged pipes. The investigation was conducted by electrical expects Harold P. Brown of New York City, E. E. Brownell of Dayton, J. H. Shaffer, metallurgist of the Pittsburg Testing laboratory, J. O. Hardy, chief chemist of the Pittsburg Testing laboratory, and Charles E. Rowe, secretary of the Dayton water works trustees.

Revision of Water Rates at Milwaukee

A substitute for the Schranck resolution in regard to a reduction of water rates has been adopted at Milwaukee, Wis. The Schranck resolution gave directions to the board of public works to revise and equalize the present rates, so that the same rates should be paid per 100 cubic feet of water for all water consumed, whether by the city, corporations, firms or individuals, and whether with meters or without meters. The council committee on water works ascertained that metered water amounted annually to 320,079,500 cubic feet, and unmetered water to 790,120,900 cubic feet, a total of 1,110,200,400 cubic feet, less leakage. The fixed charges are $64,997.50 per annum; other charges, $155,000, and the amount required for sinking fund $176,250, making the total annual cost of operating $396,247.50. The cost per 100 cubic feet was found to be 3.57 cents, while the present rate varies from 3½ to 15 cents. The substitute adopted directs the board of public works to revise the water rates of the water department so as to equalize the same as far as practicable and maintain the revenue equal to the expenditure of the department, including the amounts necessary to pay annually the interest and the sinking fund of the bonded indebtedness of the department. The revision of rates is to apply to both classes of consumers, metered and unmetered, so far as the same may be just and fair to each class according to the amount of water consumed by each, with the view of producing a reduction of rates to all without materially increasing the amounts paid at present by large consumers. The different city departments are to pay for the water used by them according to the ordinance now in force.

Equitable Assessment of the Cost of Pavements.

The greatest obstacle to a proper system of street pavements in New Haven, Conn., is, in the opinion of Henry T. Blake, president of the park commission, a lack of equitable and uniform assessment of their cost. "The present mode of assessment," Mr. Blake says, "is an incongruous jumble, which it would be hard to match for inequality, injustice and bad policy by any municipal legislation on record. Five different kinds of pavements are in vogue here: Asphalt, brick, stone block and telford and 'hardening,' which latter is really a very good macadam pavement. The cost of asphalt, brick and stone pavements is assessed on the abutting proprietors by one rule, and that of telford by another, while for 'hardening' there is no assessment upon them at all. Naturally any proposition to lay any other pavement than 'hardening' in any street is vigorously resisted by the landowners affected, while the 'pernicious' activity exerted by several localities to get

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their streets 'hardened' at the expense of their neighbors has kept the city government in a turmoil for the last year. The remedy for this is to adopt a moderate rate of assessment which shall be uniform for all new pavements, leaving it to the department of public works to determine where and of what kind, any new pavement shall be laid. This is the plan followed in building sewers and it is entirely just and satisfactory."

Mr. Blake suggests as a remedy for the unequal assessments that the legislature set aside the assessments which have been made and that new ones, on a different principle, be ordered; that a general law then be passed by which the whole matter of street paving assessments should be placed on a permanent and reasonable basis and the street paving fund should be made available for all the different kinds of pavements. With these changes the city might look for systematic progress in street paving, each street receiving the consideration which its importance demands, and the kind of pavement which its traffic requires. Mr. Blake has drafted a law, covering the changes referred to by him, which will be submitted to the common council.

Restrained from Issuing Bonds for Public Work.

The supreme court of Wisconsin reversed, Sept. 20, the decision of Judge Sutherland of the superior court, in the suit of Henry Rice against the city of Milwaukee, and restrains that city from issuing $300,000 bridge, street improvement and garbage bonds. The supreme court holds that the constitutional limit was a debt limit and not a bond limit, and that the city had already, at the time it proposed to issue $300,000 of bonds, exceeded the constitutional limit by $51,524.09. Also, the money raised in advance by taxation is a trust fund and ought not to be diverted for other purposes, and that if the money was diverted for other purposes the amount of such diversion constitutes indebtedness within the meaning of the constitution.

The Los Angeles Water Works Litigation.

Judge Oster rendered a decision Sept. 6 in the Los Angeles water works injunction cases, granting the city's request for the appointment of a receiver and enjoining the receiver being appointed to receive the moneys is of little importance. In support of the view that Judge Oster's opinion really means a practical triumph for the water company, it is urged that the opinion on file requires the city to pay for all of the present water works system before it can assume its control. In making final disposition of the cases Sept. 10 Judge Oster filed five orders, as follows: (1) Appointing Frank A. Gibson receiver and enjoining the Los Angeles City water company, the Crystal Springs land and water company and the East Side spring water company from collecting rates; (2) enjoining the city from seizing or taking possession of the plant and property of the Los Angeles City water company; (3) a similar order with reference to the Crystal Springs property; (4) granting a stay of execution in authorizing the receiver to collect the water rentals; (5) granting a stay of execution with reference to the company's being required to turn over to the receiver all moneys now in its hands as the result of collections made since the litigation was started. It is not believed that the City water company will appeal at once from the orders of Judge Oster, but that it will attempt to secure a new trial.

Public and Private Water Works.

The records in the office of the labor commissioner show that Kansas has forty-four water plants owned by municipalities, and the same number owned by private corporations, and two or three of the private plants are being converted into public plants. Several new public water works systems are also in course of construction.

Discussions of Engineering Subjects.

The Brooklyn Institute of Arts and Sciences has just issued the first edition of a prospectus, in which it announces engineering lectures for the coming season. Arrangements have been made for eight lectures, illustrated by lantern photographs, at the monthly meetings of the Department of Engineering, held on the first Friday evening of each month.

A special committee, consisting of Samuel McElroy, O. F. Nichols and H. W. Brinckerhoff, has been appointed to organize a testimonial section, comprising engineers and in-

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of mandamus to compel the officers of the old town of Dover to resume the functions of the offices which they surrendered when Dover became incorporated as a city under the act of 1895, since declared unconstitutional. The decision says: "A municipal government which is organized under an act of the legislature which is subsequently adjudged to be unconstitutional is a government de facto and its officers are officers de facto, and its authority must prevail and be respected until the attorney-general interposes by quo warranto and secures the actual ouster and removal of the incumbents in the office.

"No private citizen can challenge the legal existence of an organized municipal government. It can only be successfully assailed by the attorney-general. Until he intervenes the government is de facto and the public functions with which it is charged within the scope of its apparent powers may be lawfully exercised by its officials as de facto officers.

"There is manifest error in the proposition that in resisting the levying of taxes or the enforcement of ordinances the legal organization of the body politic can be attacked on the ground that it is established under an unconstitutional act of the legislature."

Valuation of Water Works.

A report has been submitted to the Indianapolis board of public works on the proposed purchase of the water works plant by John W. Hill, C. E., of Cincinnati. Mr. Hill values the plant at $1,906,682.01, while the proposition offering it to the city places it at over $3,000,000, including interest on deferred payments for twenty-five years. Mr. Hill bases his value upon "the assumption that there has been no deterioration, wear or depreciation in value of any portion of the property. While this is almost true of certain structures, it is not true of buildings, machinery, pipes, valves, hydrants, dams and other details which are constantly being impaired, or which as time progresses, become obsolete and no longer profitable to use." The deficiencies to be deducted are cited as follows:

"1. The value of materials and labor for extension and improvement of the system of rock wells until these shall furnish a supply of water equal to the present maximum consumption.

"2. The cost of reconstructing the reservoir gallery at the riverside pumping station to make this water-tight and prevent infiltration of water into it from the river, and the cost of 5,000,000 gallons of increased storage capacity.

"3. The contract price of the Snow pumping engine, which is not, and has not, since it was erected and started ten months ago, been in condition for continuous daily service at its contract capacity of 20,000,000 gallons of water per diem. (This engine, or its equivalent, is absolutely essential to the demands of the Indianapolis water works at the present time, and the lack of its full capacity, doubtless, has, and will continue to cause, a serious drawback in the operation of the works.)

"4. The cost of reinforcing the pipe system by one or more large feeder mains from the force mains at the riverside pumping station, to such points as a careful survey will show is necessary to overcome the objections to reduced pressures upon the higher elevations, and in such portions of the city where this difficulty is now experienced.

"5. The depreciation of the perishable and renewable portions of the works."

Of a list of seventy-two cities Mr. Hill says that less than seventeen furnish water at rates lower than Indianapolis and ninety-four cities charge higher rates than that city. From a list of eighty-five of the largest cities of the United States only five charge a generally lower rate than Indianapolis; all others have rates as high or higher than Indianapolis. Some conditions of service in Indianapolis favor low cost of operation, and when fully developed may admit of some reduction of the present water rates, but such reduction cannot with safety be made upon the present average daily consumption of water, which is very low for the population of the city and mileage of pipe in the distributing system. Mayor Taggart has ordered a pamphlet, containing copies of the contracts with the water company, correspondence regarding the proposed purchase, etc., printed and hopes for deliberate, but not delayed action.

Tests of Stone for Road-Making.

The experimental work of testing road-building stone, which has been carried on at Harvard university under the supervision of L. W. Page, a geologist, is described in the report of the highway commissioners of Massachusetts. The commission is composed of T. C. Mendenhall, W. E. McClintock and C. W. Ross. In making these inquiries the aim has been to determine the nature of the qualities which constitute fitness or unfitness of the different kinds of rocks for use in road making, the effects of diverse methods of treatment used in the process of construction, and the relative value of the bed rocks and gravels which are found in the several parts of the state. The abrasion and the cementation tests have proved most useful thus far. The machine used in conducting these tests were designed by William Page, under the direction of the commission. The abrasion machine was modeled after the Deval machine, such as is used in making similar tests at the national school of roads and bridges of France. In making the

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abrasion tests with the Deval machine the stones employed are of such sizes as will pass through a screen with a 2½-inch mesh and not through a screen with a one-half-inch mesh. In making the test eleven pounds of stone, previously cleaned, are placed in the cylinder; the air-tight cover is then screwed on and the cylinder rotated at the rate of 2,000 revolutions an hour. The rotation of the cylinder throws the fragments of stone from one end of the cylinder to the other twice in each revolution. At the end of five hours, or 10,000 revolutions, the machine is stopped, the cylinder opened and the contents emptied into a basin. The cylinder and cover are carefully washed and the water used is poured into a basin. Each stone is then washed and brushed under the water and is thus cleaned from the adhering dust, which remains in the water as a sediment. After it is dry the detritus is emptied into an automatic sieve which separates that below one-sixteenth of an inch from that above. The per cent. of the one-sixteenth-inch dust may be taken as a coefficient of wear, or the coefficient adopted by the French school of roads and bridges may be adopted by the formula—

$$\text{Coefficient of wear} = \frac{40}{w}$$

where w is the weight in grammes of the detritus, less than one-sixteenth of an inch in diameter obtained per kilogramme of stone.

The tests on all specimens are made under precisely similar conditions, so that all results are comparable. The tests on the more common rocks show the following results:

Kind of Stone.	Highest result. Coeff. of wear.*	Highest result. Per cent. of wear.	Lowest result. Coeff. of wear.*	Lowest result. Per cent. of wear.
Diabase (trap) ...	30.40	1.31	9.28	4.31
Granite	21.16	1.90	8.41	4.76
Felsite	19.91	2.01	12.30	3.25
Gneiss	23.02	1.73	5.01	7.98
Limestone	17.20	2.33	6.31	6.34
Schist	12.52	3.19	4.87	8.20
Quartze	20.34	1.97	9.07	4.41
Field stone (erratics)	19.19	2.08	5.43	7.30

*On the French system.

For testing the cementing value of stone, ing a pencil at its free end. The pencil has a vertical parallel movement five times as great as that of the plunger, and its movement is registered on a drum against which the pencil presses. The drum rotates through a small angle at each stroke of the hammer; thus an automatic diagram is taken of the behavior of the briquette throughout the whole test. The point brought out by this machine is the fact that, when the hammer falls on the plunger, if the material beneath it can withstand the blow, the plunger recovers from the downward thrust given it by the hammer; if not, the plunger stops at the point to which it is driven. In this way the number of blows previous to the critical blow, which destroys the bond of cementation, are accurately recorded on the drum.

The briquettes for the cementation test are made by reducing the stone to a dust that will pass through a sieve of 1-100 of an inch mesh. The powder is put into a slightly tapered steel die of circular section, about 1.33 in. in diameter and .98 in. in hight, mixed with water and subjected to a pressure of 4,400 pounds. The briquette resulting from this is put aside for at least one week, in order to become thoroughly dry.

Street Paving in Chicago.

Under the special assessment law very little paving is being done in Chicago this year. It is estimated that of possibly thirty miles of paving laid since Jan. 1, 1898, 50 per cent. is in new streets, and six miles of this is of cedar blocks on wood base. Only $916,000 was set aside this year for the bureau of streets, while $1,580,000 is required to keep in repair 765.43 miles of cedar block pavement alone. Statistics compiled from the figures of the streets show that of this 765.43 miles of cedar block paving only 20 per cent. is in good condition. The other kinds of pavements and their condition are as follows: Of 357.17 miles of macadam 50 per cent. is in bad condition; Medina stone, 2.29 miles all in good repair; of 25.69 miles of granite block 90 per cent. is in good condition; of 55.26 miles of asphalt, 2.97 miles of block asphalt and 14.80 miles of brick all is in good condition.

Chicago has no general fund which can be

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local improvements for the form of pavement he may desire. The new law contains a provision which permits the board to declare emergencies in special cases, but when the general sentiment is not in accord with the movement this will rarely be resorted to.

Special assessments levied and confirmed by the courts last year for street paving amounted to $1,124,856.90, which was expended as follows: Wooden blocks, $551,260.39; brick, $119,698.13; macadam, $77,216.59; asphalt, $447,507.55; granite, $28,773.24. These expenditures are exclusive of alley paving, for which assessments amounting to $19,000 were levied. Chief Engineer Wheelock is of the opinion that the fact that an increase over other years is shown in the amount of asphalt used is a good indication. He also maintains that while there is a lack of activity in building new streets, yet there is a tendency to abandon the cheaper pavement for the more durable kinds. The commissioner of public works, L. E. McGann, does not have such a hopeful view of the future for street paving, but, on the other hand, can see no relief in sight from the operation of the special assessment law, and is helpless to better affairs under present conditions.

A Contractor Paid in Advance.

The village of Highland Park, adjoining Detroit's northerly limits, has made repeated applications for permission to connect with the public sewer in Woodward-ave., the main thoroughfare running through the heart of the city. In the event of being successful the village would commence operations and bring the sewer down two miles to the big main. The board of public works refused a permit unless the city was compensated for the privilege and the amount was fixed at different times in sums ranging from $20,000 to $30,000. About the middle of August the village sold bonds for sewer construction, and after being promptly purchased and the cash paid, a contract was made with James Hanley to build 10,000 feet for $51,000 and the price was paid in advance, an almost unheard procedure in public work. The contractor agreed to take the responsibility of making the connection with Detroit's main sewer. The price is fully $1.50 per foot more than contracts now under way in Detroit this season. The board of public works positively refused to grant a permit. Mr. Hanley's workmen were within fifty yards of the city limits, and the intention was to secure a connection while the board was napping. But President Moreland, always wide awake, started the corporation counsel on the contractor's trail. A special meeting of the common council was called and steps taken to prevent trouble. The matter was taken into the courts and an injunction was issued at once, restraining Mr. Hanley from connecting with the Woodward-ave. sewer. Speaking of the peculiar move of the Highland Park people, Mr. Moreland said: "The action of the village in going ahead with the work without consulting the city authorities is something which paralyzes the old sewer contractors and has called forth criticisms which are anything but favorable. The village should be able to explain why it is paying so much more per foot for sewer work than is being paid in Detroit. But the contractor agreed to make the connection with the Woodward-ave. sewer. If he fails all the money used to bring the work down to the limits will be lost. One of the functions of the board is to give or withhold permits to enter all kinds of sewers within the limits. The matter will have to pass through our hands and possibly the common council as well. I want to say emphatically that my vote will not be cast in favor of connecting with the Woodward-ave. sewer, unless compensation is made to the city for the privilege. My colleagues on the board share my opinion in the controversy."

Brick Paving in Detroit.

Although the paving season is drawing to a close work has not been brisker in Detroit at any time since early spring. A score of streets are under way to be paved with cedar block on concrete foundation, two jobs of asphalt and a number of brick streets and alleys are in progress. The last issue of Municipal Engineering gave the details of the suit brought to restrain the city from entering into a contract for the paving of Atwater-st. The case was apepaled to the supreme court and no decision has yet been handed down. In the meantime the Board of Public Works mapped out a plan whereby the eight streets for which money had been raised by taxation for repaving with brick would be completed. Specifications were prepared and a communication sent to the common council, dealing only with ten streets in question, which was promptly acquiesced in and the work is now being rapidly pushed along. The communication, which will be read with interest, is given in full:

"The position heretofore taken by the Board of Public Works in regard to brick laid in our streets, namely, that none but that of the best quality should be used, and that the Board of Public Works, as the responsible administrative body, should be and is, under the law, the judge of such quality, is hereby reaffirmed. But as the paving season is rapidly passing by, and the

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work of paving our streets, for which the people have taxed themselves, is being delayed, and not desiring to be charged with or be a party to obstructing the progress of public improvements, the board hereby notifies your honorable body that it will entertain bids and enter into contracts with the lowest responsible bidders for the paving with such kind of brick as may be designated by your honorable body. In doing this, the board desires it to be understood that while it will do the best in its power to protect the interests of the city as it sees them, the responsibility for results in the selection of paving brick, as above mentioned, against its protest, must rest with your honorable body, Very respectfully.

"D. W. H. MORELAND,
"President of the Board of Works."

Exhibit of Clay Industries at State Fair.

The Executive Committee of the Illinois Clayworkers' Association has made arrangements with the Illinois State Fair Association for an exhibit of the clay industries of the state, to be held each year at the state fair grounds, Springfield, Ill. The fair this year was held Sept. 26 to Oct. 1.

Street Repairs in District of Columbia.

The report of C. B. Hunt, the computing engineer of the District of Columbia, to Captain Beach, the Engineer Commissioner, shows that during the fiscal year ending June 30, 1898, $29,955.88 was spent in repairs to streets, avenues and alleys, and $149,999.32 on repairs to concrete pavements; that 14,266.23 sq. yds. of street pavements were laid and that the city now has 262.65 miles of pavements, including the pavements laid in suburban sub-divisions by property-owners. These pavements have never been formally accepted, but, having cost the District nothing, it is expected that they will be kept in repair at public expense. The policy pursued during the last year of excluding macadam and gravel roadway pavements from streets added to the schedule of work submitted in the yearly books of estimates is believed to be sound and should be perpetuated. The proper materials for this class of work are such as are best suited to the street and its traffic, and it is certain that a sheet or block pavement offers every advantage. A street improved with macadam or gravel is found in a short time again pressing for a place on the list of streets to be paved. Once paved with proper regard to its requirements it is eliminated from future similar consideration. Emproperties. An innovation in the vitrified block pavements has been the introduction, at intervals of about 60 ft. in the length of the alley pavement, of expansion joints filled with asphaltic cement in order that temperature changes may be taken up at those points. Asphalt block pavements do not require this construction as their nature is sufficiently elastic.

St. Paul's Delinquent Water Bill.

The water commissioners at St. Paul, Minn., has given notice that there is due the water board from the city about $450,000 for water furnished for fire purposes since December, 1891. The water board furnishes the city water for fire purposes and charges a rate of about $60,000 per year. Bills have been sent the comptroller regularly every six months since December, 1891, but no attention has been paid to them.

City Not Bound by Contract Unless Made in Writing by Order of Council.

The judgment of the lower court, in the case of the J. M. Griffith company against the city of Los Angeles, has been affirmed by the supreme court. The facts of the case are as follows: The city and certain contractors executed, April 24, 1893, several instruments whereby the contractors agreed to construct, at their own cost for labor and material, sections 3 and 6 of an out-fall sewer leading from the city to the ocean, for which construction the city agreed to pay the aggregate sum of $77,450. The sections were constructed and the contractors received most of the compensation provided in the contract. They assigned to the plaintiffs these claims against the city for some unpaid balances, and for the value of certain alleged extra material used by them in the work. In the trial court the plaintiffs got judgment for some hundreds of dollars, but not for all of its demand. From the contract price the sum of $5,000 was withheld for application to cost of repairs during the first six months. The city began repairing during the sixth month and continued from August to February. The main issue was for cost of certain steel bands used for securing the pipes laid. The supreme court says in connection with this: "The city charter provides that the city of Los Angeles shall not be bound by any contract, or in any way be liable thereon, unless the

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tent or the price of changes in the work then under contract. If it could be effectual to charge the city against its will for the additional bands (for securing certain pipes), then it is not perceived that the contract afforded any protection whatever to the city against the indefinite expansion, both of the plan and cost of the sewer at the pleasure of the engineer and contractors. In our opinion the terms of the contract do not support plaintiff's claim for the value of said bands."

Diversion of Percolating Water by One Corporation from the Lands of Another Corporation.

The supreme court of New York rendered a decision recently relating to the ownership of underground water. The suit was brought against the city of Brooklyn by the Merrick Water company, which collected the water it sold from what it was claimed was an underground stream supplied by a watershed. This stream, it was claimed, came to the surface on the company's land and flowed into ponds which it owned. The city of Brooklyn acquired a strip of land north of the company's pumping station, sunk wells and erected pumping stations on it, from which water was delivered to the city. The referee, by whom the case was first heard, found that the effect of the defendant's pumping had been to lower the permanent level in the company's well from seven to eight feet. In reviewing the referee's judgment the court held that the evidence failed to prove the existenc of a subterranean stream of water supplying the well in question, and that the interruption was, therefore, one of percolating water. The legal question was the diversion of percolating water by one corporation from the lands of another corporation, both engaged in collecting the water, not for use on the land itself, but for transportation and sale to third persons, who had no interest or right of use of the water as connected with the land. The court held that in this respect their rights were equal, and the same rule was applicable as would apply in case either owner desired to improve its land for use. Then neither party would be liable for the diversion of percolating water, because he was engaged in the exercise of a legal right, and the rights of each were equal in the use and employment of the land. When both seek to use the land for exactly the same purpose, and neither seeks to improve it for the purpose of beneficial enjoyment, but to make a profit from the business carried on, the right to such use must also be equal. Under such circumstances if one gets more than the other there can be no more ground for complaint than would exist if both sought to improve their own land and one secured more than the other, or one was damaged and the other not.

Testing Sewer Pipes of Cement and Clay.

The preliminary report of Mr. Max Gary, who was appointed by the International Association for the Testing of Materials to take charge of the investigation of methods of testing sewer pipes of cement and clay, has been published in "Les Materiaux de Construction," Nos. 23 and 24. The committee, at the head of which Mr. Gary was placed, was appointed in 1896. In 1895 he investigated, for the German Association of Manufacturers of Portland Cement, the methods employed by governments, municipalities and individuals in testing the strength of cement pipes. He found that these tests varied in each case and none were regarded as complete for the purpose intended, and that similar conditions existed in other countries than Germany. Mr. Gary concluded that the points to be determined in the tests to be made were as follows: The resistance to internal and external pressure; impermeability; resistance to the attack of acids; the wear and tear upon the interior by sand passing with the water. The tests should then mainly determine the bursting and crushing strength, and the texture and composition of the paste used. In a cement or clay pipe the most important property is the resistance to exterior pressure, for, with few exceptions, such pipes are simply covered with earth or sand, and not placed in masonry. It is necessary in passing judgment upon the fitness of these pipes to distinguish between the loads to which they are to be subjected, as pressure upon them will differ, some being laid under traveled streets, under railway embankments, or under the foundation walls of buildings. The practice of a number of German cities in the test of cement is detailed by Mr. Gary as follows:

The Department of Public Works of Liegnitz requires that a cement pipe one meter (3.28 ft.) diameter should resist the pressure of a layer of earth three meters (9.48 ft.) thick; at Rosenheim, pipes covered with 12 to 16 ins. of earth should resist the pressure of a heavy vehicle; and at Colmar, when there is any doubt of the solidity of a pipe, a loaded wagon is passed over the laid pipe. At Schwerin, in Mecklenburg, cement pipes must resist, without cracking, a pressure equal to 50 kilograms per linear meter and per centimeter of diameter. This test is made by placing railway rails on the top of the uncovered pipe. The city of Freysing

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prescribes that the pipe should support a "load of 6,000 kilos, concentrated upon the top of the pipe;" and Passau demands that the pipe resist a pressure of 805 lbs. per lin. ft. At Zeitz, where the pipes are buried 6 to 8 ft. beneath the surface, a steam road roller is passed over them before acceptance. Clay pipes, one meter diameter, have been tested at Mannheim, by burying them in the earth, with a covering layer about 18 ins. thick. Over the pipe was then placed a double plank platform, about 3 ins. thick in all, and 3.28 ft. square, and on this was placed the test load. The rupturing load was found to be about 28,600 lbs.

For the test of pipes of "armed-cement," or cement reinforced by a double iron mesh on the Zisseler system, the engineer of bridges, at Breme, prescribes the following test: The pipe is buried in sand in a solid wooden box; then by means of a cover fitting inside the box a pressure of 7,500 kilos. per running meter, or about 500 lbs. per lin. ft., is applied to the pipe. The pipe is required to stand this pressure without deformation or cracking. For pipes of oval section, 120x96 cm., and sides 6.5 cm. thick, armed with three layers of metallic mesh, a uniform load of 9,000 kilos. per meter, or a little over 600 lbs. per foot, is prescribed. At the Hague the resistance of beton pipes is determined by placing them in a trench and then loading them uniformly on the square meter of horizontal projection. One pipe in each 50 is submitted to this test; and this load is carried up to 12,000 kilos. for pipes 1.5x1 m. and 1.2x0.8 m. At Copenhagen Mr. Emanuel Jensen employs a process for testing pipes of clay and of "armed cement" which has given very satisfactory results. A heavy timber is imbedded in the soil, carrying upon one end a heavy counterweight of cement, and near this are two bars of iron, pierced with holes, attached to the sides of the timber. The pipe to be tested is placed in a strong wooden box, nearly filled with sand, and resting upon the timber, and pressure is applied to it by a lever and saddle with the lever support on a pin passing through the holes in the iron bars. The advantage of this process is that the commencement of cracking in the pipe can be noted; though this is of little advantage in the test of clay pipes, as after the appearance of the first crack the pipe will support but little more. But in the case of sistance of pipes to exterior pressure is tested by a Kirkaldy machine, the pipe being placed between two wooden saddles which each embrace one-third of the circumference of the pipe. But as it is difficult to insure contact with all the inequalities of the pipe the process is not satisfactory.

The Duty of a City in the Construction of a Sewer.

Judge Bartlett, Appellate Division of the New York State Supreme Court, has rendered a decision in a suit brought by Thomas F. Martin of Brooklyn to recover the value of his property for damages caused by inadequate sewers. A violent thunder storm and heavy rainfall on Aug. 31, 1895, overcharged the sewers along one street, and the surplus water flooded one of the lots and entered a building where a number of barrels of lime were stored. The lime was slaked, setting fire to the building and burning a quantity of woodwork. In his decision Judge Bartlett stated that a municipality cannot lawfully maintain a sewerage system, which, because of its inadequacy to carry off the combined sewage and rainfall reasonable to expect, creates a nuisance on the property of adjacent landowners. Ample evidence was given before the trial court to show that the sewer had often been so overburdened as to force up the manhole covers and allow water to escape over the street and occasionally over the adjoining lots. While this happened only in heavy storms, yet it occurred with enough frequency to show that the sewers in that part of the city were incapable of carrying off the quantity of sewerage and rainwater which it is reasonable to expect to flow into them under conditions of weather by no means unusual. The fact that during previous storms when property in the vicinity had been flooded this particular building had not been affected, made the case somewhat complicated. The owners of the property had, however, raised the grade of sidewalk along the premises a short time before August, 1895, in order to protect against further floods, so that the overflow on Aug. 31 found its way to the storehouse in which the lime and woodwork were kept for the first time. Judge Bartlett decided in favor of the plaintiff. He said that "assuming the inadequacy of the sewer, any property-owner whose premises are likely to be flooded had

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not otherwise have suffered. It was the duty of the city, if it undertook the construction of a sewer there at all, to construct it in such a way that even in heavy rains none of the neighboring private property should be flooded by reason of its lack of capacity."

Need of Permanent Street Monuments.

In a report by Adin Mann, city surveyor at Elgin, Ill., he says that the street monuments of that place are in a wretched condition. The original line stakes disappeared years ago, and, as few of the first monuments remain, the original starting points of bounds cannot be found. This condition, together with the large surplusages in most of the older parts of the city, have caused an almost inextricable confusion. The property-owners cannot re-establish the lines and consequently there are many encroachments of several feet on the streets. Mr. Mann says "the only remedy is a thorough, careful survey by the city of each plat as a whole and in connection with all the surrounding plats, and the planting of permanent monumets of stone or iron at every corner, with a map made of such survey, approved by the city council and made a matter of record."

Things Found in a Sewer.

Among the things removed from a sewer in Baltimore, Md., recently by F. R. Bye, street cleaning commissioner, was a spring bed, a roll of roofing tin five feet long, three wash boilers, four brooms, a coil of telephone wire and a wheel of a bicycle.

A System of Water Works in a Private House.

A citizen of Orion, Ill., has solved the problem of having a system of water works in a private house where the town has no water works. He placed on the second floor of his house a galvanized iron tank which will hold fifteen barrels of water. The water is taken off the roof to the tank and there is an overflow pipe running to the cistern; the tank is carried some four or five feet from the floor, which gives sufficient pressure to force it to any place desired in the house; pipes run from the tank to a boiler in the kitchen, where it is heated by the cook stove. In this way both hot and cold water can be supplied, the hot water coming from the kitchen and the cold water from the tank. Arrangements are made to keep the tank supplied in the winter, when there are no rains, by pumping from the cistern.

Meeting of the American Society of Civil Engineers.

The American Society of Civil Engineers met Sept. 21, the subject of road-building being under discussion. A letter from P. McLeutze of the New York state road department was read in reference to the model roads, for which an appropriation of $50,000 had been made. The only road built so far on this plan is between Schenectady and Troy, but a number of applications have been filed by different counties. Mr. James Owen spoke of the material change in the good roads question within the last five or six years, and said his own theory and practice had been greatly modified to correspond with the new conditions and developments; that competition between roads and pavements, which has been effected by decreasing the prices of ordinary permanent pavements has been the leading factor in the change; when a telford pavement cost 82 cents a square yard and an asphalt pavement costs $1.38 it is evident that the permanent structure becomes available in many places that could formerly consider only road-building. He did not believe in thin roads, and considered a thickness of five inches of telford and three inches of macadam better than eight inches of macadam alone; but ten inches of telford is usually cheaper and gives better results than eight inches of macadam. Trap rock is the sine qua non for telford and macadam. Formerly he required all stone to be of a size that would pass through a 1⅛ or a 1¼-inch ring, but strict observance of this rule has made trouble, and he had modified his views in regard to size and abandoned the cast-iron rule. The size of the stone should be according to the locality, and he now classifies it according to the character of the travel. One and one-half inches is good for country travel, but not for a heavily traveled road, where it should be increased to two or three inches, which gives better results, more uniform service and greater economy. The size of the stone must not be mixed or varied, or any dust used. Engineers must insist on uniformity; sand, gravel, loam, clay or almost any other available material will answer for binding the stone, but ordinary earth is the best, and all should be used sparingly for binding and filling. Clay is treacherous and has been known to spoil a road. Packing and binding material must be used with judgment and with special reference to the weather, present and prospective. It can be used more freely in dry than in wet weather. Limestone needs very little binding and shale none at all. A trolley railway track in the middle of a telford

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pavement gives entirely different conditions of maintenance from those that obtain with an ordinary homogenous road, and greatly increases the cost and difficulty of maintenance. He now uses three inches of macadam stone and gives each side of the railway an individual crown and covers it with gravel. His experience was that trolley tracks double the cost of maintaining macadam roads.

W. E. McClintock said that in the work of the Massachusetts state road commission the most difficult roads have been built first, so that the cost would diminish instead of increase as the work progressed. So far all roads 15 feet wide with 3 feet shoulder on each side have cost $10,300 a mile. Strict attention is paid to drainage on clay or non-porus soil, telford roads being built with a foundation carefully rolled and covered with three inches of gravel. On this 6 inches of rock is laid on the largest face, with the longest dimensions transversely; the interstices are filled with wedged stone tightly driven; the points are broken off to the 6-inch level and the surface filled with small stone and well rolled. Broken stone of telford foundation is made to give a finished thickness of 5 inches in the center and 4 inches on the sides after heavy steam rolling. Without a telford foundation the thickness on good soil is 6 inches at the center and 5 inches at the sides. When the soil is doubtful the broken stone has been re-enforced by 2 inches of gravel laid on a rolled sub-grade. Road stone is selected for hardness and toughness; trap rock is generally the best, but sometimes does not give the best results. Country roads are worn more by the weather than the traffic, and for them trap rock does not wear enough to replace the dust that blows away. In these cases a top dressing of screenings is used, except in some cases where a small sprinkling of sand has been substituted. Another method is to cover the top of the stone with blue gravel before the screenings are applied; the order of materials is reversed, placing the 1¼ inch stone at the bottom and the 2½ inch on top, always keeping the different sizes scrupuously separated.

have been built cheaply on solid sand, where the gravel had to be hauled only a short distance, at a total cost of from $1,000 to $1,500 a mile.

N. P. Lewis, engineer of street construction and maintenance, Brooklyn, N. Y., said the construction of good roads should be kept constantly in view and actually begun long before the contract is let, by preliminary adjustment of grades and alignment, which may be made at any time, and the roads finished years later. Drainage is the first essential in road building, and, if not in porous soil, sub-ditching and underdraining may wisely be effected long in advance of the completion of the work. He considered that some variation in the size of macadam stone is admissable; stone passing through cylindrical sieves of 2 inch mesh and refused by those of ¾ inch mesh gives about the same results as that of uniform size that is rolled until the top is broken enough to fill the void. Screenings and flour and quarry sweepings are much used for top dressing, and he had specified for it 60 per cent. of screenings and flour mixed with 40 per cent. of sand and gravel.

Calvin Tompkins said sufficient attention is not given to consolidating the road into a monolithic mass of stone. Macadam's idea of making the road simply a wearing surface was right.

G. A. Roullier suggested that the thickness of the roadbed is the only flexible factor in its construction. If the roadbed is strong enough the conditions of service are independent, and nothing is gained by adding extra thickness. Thin roadbeds must have coarse, hard binding materials. Sand and coarse screenings will generally give the best results. Many failures have been caused by the use of soft fillers; raveling is prevented by the addition of 30 per cent. of limestone dust to the filling.

E. W. Harrison, chief engineer of the Hudson county public roads of New Jersey, said Hudson county boulevard is a city street from 12 to 14 inches deep and is composed of 8 inch trap rock telford, 4 inches of 2 to 2½ inch macadam, with 1½ inch stone on top and finished to a hight of 1¼ inches

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rolled, no chips being allowed; the 2½ inch and the 1¼ inch course of macadam stone were rolled separately. Repairs have been made by rolling in 1½ inches of small stone where required on the surface.

J. J. McLaughlin, county engineer, Queens county, New York, said the heaviest roads in that county are 8 inches thick in the center and six inches on the side. In Jamaica three-fourth of a mile of street was built of 4 inch macadam spread loosely, and sustained a traffic of from 80 to 100 wagons per day for three months without trouble, injury or wear. The road that is originally poorly built may be redeemed by good maintenance.

Technical Meetings.

The first annual meeting of the American Section of the International Association for Testing Materials was held at the Engineers' Club, Philadelphia, Aug. 27. The by-laws adopted are suplemental to the general laws of the International Association and are intended solely for government of what formed one section of the association. Each member shall pay $2.50 annual dues, of which $1.50 shall be transferred to the international association and the remainder used to defray the expenses of the American section. The officers of the American section will be a chairman, vice-chairman, secretary and treasurer, constituting the executive committee, and two members of the international advisory board. The American member of council of the international association shall be ex-officio a member of the executive committee. The officers of the American section shall be elected at annual meetings and shall serve for two years. The problems, which are to be investigated by the international committees, and the American members who will act upon these committees are as follows:

1. "Testing as a basis the existing conditions of inspection, to establish uniform international rules for the testing and inspection of all kinds of iron and steel." Two members to be appointed.

2. "Determinations of methods of test of the homogeneity of iron and steel with the object of eventually employing these methods for inspection." Booth, Garrett & Blair, Gus. C. Henning, Prof. Thomas Gray, Paul Kreuzpointner, A. A. Stevenson, William R. Webster.

"Preparation of uniform methods for the test of paints used for protection against corrosion of railroad structures." H. B. Seaman, J. A. L. Waddell, and two members still to be appointed.

3. "Unification of methods of test of tile pipe." One member to be appointed.

"Supplemental to the solution of the question of standard consistency of standard mortars. Determination of conditions which will produce approximately similar densities in tension and in compression briquettes." Richard L. Humphrey.

4. "Investigation of the behavior of soft steel under abnormally low temperatures." Prof. George W. Bissell.

5. "Methods of tests of welds and weldability." One member to be appointed.

7. "Collections of masses of material for the preparation of standard piece tests, with special reference to axles, tires, springs (car), cast and wrought iron pipes, as well as the separate parts of structures." One member to be appointed.

10. "Investigations of the most practical methods of polishing and etching for microscopic study of wrought iron." Albert Sauveur.

11 and 12.—"Study of the relation of chemical composition to weathering qualities of building stones. Study of the effect of the gases of combustion, especially sulphurous acid." One member to be appointed.

"Study of the relation of chemical composition to weathering qualities of roofing slates." Prof. Mansfield Merriman.

14. "Determination of rapid methods for determining conditions of constancy of volume of hydraulic bond materials." Richard L. Humphrey, William M. Maclay.

15. "In what manner can hydraulic bond materials be tested for tensile strength in the shortest period of time?" William W. Maclay, Dr. Charles F. McKenna.

16. "Testing and evaluating the resolutions of the conferences relating to the determination of adhesion of hydraulic bond materials." Booth, Garrett & Blair and one member still to be appointed.

17. "Examination of propositions for the uniform determination of the value of puzzolanas as mortars." Two members to be appointed.

19. "Investigation of the effect of fecal matter on the strength of hydraulic bond materials." Two members to be appointed.

18. "Investigations of the causes of abnormal behavior of cements as to the time of setting." Two members to be appointed.

22. "How can the inspection of lumber assure protection against the growth of fungi (merulius lacrymans)?" Prof. John B. Johnson.

23. "Determinations of fundamental methods for testing lubricants (oils)." One member to be appointed.

"American committee to report to the

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American section on the present state of knowledge of impact tests." Prof. W. K. Hatt, chairman; Prof. Edgar Marburg, James Howard.

The reports will probably be published either abroad or in a special proceedings on this side, although a consideration of this point just at present is deemed premature.

The German Gas Light association will hold its annual meeting at Niagara Falls, N. Y., Oct. 19. 20 and 21, 1898. Some of the papers to be presented are as follows: "The Effect of the Depth of Fire Upon the Practical Efficiency of a Water Gas Generator," J. M. Rusby, Jersey City, N. J.; "Notes on Mains and Main Laying," Walton Fustall, Philadelphia, Pa.; "The Loss of Illuminating Power of 25 to 30 Candle Gas When Mixed with Air," Dr. E. G. Love, New York City; "A Comparison Betwen the Cost of Pumping Gas By Steam and Gas Engines," H. L. Rice, Norfolk, Va.

The convention of the Central States Water Works association was held in Springfield, O., Sept. 27, 28 and 29.

The seventeenth annual convention of the American Street Railway association was held in Boston Sept. 6-9. Officers were elected for the ensuing year as follows: President, Chas. S. Sargeant, second vice-president of Boston Elevated Railway company, Boston; first vice-president, Henry C. Moore, president Trenton Street Railway company, Trenton, N. J.; second vice-president, Ernest Woodruff, president Atlanta Consolidated Street Railway company, Atlanta, Ga.; third vice-president, Walton H. Holmes, general manager Kansas City Railway company, Kansas City, Mo.; secretary and treasurer, Thos. E. Pennington, treasurer Chicago City Railway company, Chicago, Ill. The next convention will be held in Chicago.

The seventeenth annual convention of the New England Water Works association was held at Portsmouth, N. H., Sept. 14, 15 and 16. The papers presented were as follows: "The Method for Determination of Color, and the Relations of the Color to the Char-acter of Water," Prof. Sedgwick, Boston; "Result of Tube Well Experiments in Lowell, Mass.," George Bowers, city engineer of Lowell; "Surface Water Supplies," John C. Haskell, Lynn, Mass.; "Description of the Separate High Pressure Fire Service System of Providence, R. I.," C. V. French, Boston, Mass. The convention voted to change the constitution so as to allow meetings to be held outside of the New England states, and Syracuse, N. Y., is being considered for the next convention. Officers were elected as follows: President, F. F. Forbes, Brookline, Mass.; vice-presidents, M. A. Sinclair, Bangor, Me.; C. K. Walker, Manchester, N. H.; F. H. Crandall, Burlington, Vt.; R. J. Thomas, Lowell, Mass.; Byron I. Cook, Woonsocket, R. I.; R. S. Bartlett, Norwich, Conn.; secretary, J. C. Whitney, Worcester, Mass.; treasurer, G. E. Batcheldier, Worcester, Mass.; executive committee, J. C. Haskell, Lynn, Mass.; G. A. Stacey, Marlboro, Mass.; Patrick Kiernan, Fall River, Mass.; finance committee, Wm. F. Codd, Nantucket, Mass.; A. W. F. Brown, Fitchburg, Mass.; Horace Kingman, Brockton, Mass.; senior editor, Joseph E. Beals, Middleboro, Mass.; junior editor, W. H. Richards, New Lindon, Conn.

Personal Notes.

C. M. White has succeeded Mayor Anderson at Clinton, Ind.

Joseph Wilson was installed as mayor Sept. 5 at Washington, Ind.

William Waplington died at his home in Philadelphia Aug. 10.

J. A. Pinkston has been elected city engineer at Orange, Tex.

Philip A. Jackson, city engineer, Dorchester, Mass., died recently.

Martin L. Saulsbury, C. E., Ridgley, Md., died Aug. 22, aged twenty-six years.

Capt. J. H. Gunning, road builder and contractor, Vicksburg, Miss., died Sept. 5.

Dr. W. W. Zimmerman has succeeded Hon. J. S. Ostrander as mayor at Richmond, Ind.

H. R. Hobart has resigned his position on the editorial staff of the Railway Age at Chicago.

Andrew M. Willoughby has been elected mayor, to succeed Hon. Cicero F. Northern, at Greensburg, Ind.

Frank J. Illig has been appointed superintendent of the water bureau, to succeed Col. Francis G. Ward at Buffalo, N. Y.

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A. R. Dow has been appointed superintendent of the Salem Water company, at Salem, O., to succeed F. W. Allison, deceased.

Asa Williams of Owensboro, Ky., has been apopinted chief engineer of the water works at Paducah, Ky., to succeed D. C. Holly, resigned.

E. C. Oliver, C. E., Alpena, Mich., has been appointed chief engineer of the water works gineering in the University of Illinois, Champaign, Ill.

Prof. Edward Orton, state geologist of Ohio, has been elected president of the American Association for the Advancement of Science.

Charles A. Hague, M. Am. Soc. C. E., New York City, was selected by the city council of Camden, N. J., to test the water works of that city.

G. M. Briggs, civil engineer and surveyor, has established an office in the Farmers' and Manufacturers' bank building, Poughkeepsie, N. Y.

H. E. Wells of Columbus, Ind., has been elected superintendent of the light and water plant at Rushville, Ind., to succeed A. T. Mahin, resigned.

M. F. Offet, who has had general supervision of the Barber Asphalt company's business in Saginaw, Mich., has been promoted to assistant general manager.

W. M. Leftwich, jr., has been appointed city engineer, to succeed W. W. Southgate, and Felix Smith has been appointed assistant city engineer at Nasnville, Tenn.

Daniel H. Johnson, for several years superintendent of the water works and member of the water board at Salem, Mass., died at Stamford, Conn., Sept. 7, aged sixty-eight.

J. S. T. Stranahan, ex-president of the park commission, Brooklyn, N. Y., and ex-president of the board of trustees of the Brooklyn bridge, died of apoplexy Sept. 3, at Saratoga, N. Y.

David E. McComb, M. Am. Soc. C. E., superintendent of sewers, Washington, D. C., was ordered recently to visit Boston, Chicago, Milwaukee and Montreal, Quebec, to examine works in connection with the preparation of plans for the pumping station for the sewage disposal system of Washington.

L. M. King, superintendent of the public works department of the Merchants' Association, San Francisco, Cal., and President Dohrmann of the association, visited the East early in September for the purpose of inspecting and collecting information relative to public works, such as paving, sewerage, street lighting, drainage, street railway service and cleaning and sprinkling streets.

Dr. John Hopkinson, the English electrical engineer, with his son and two daughters, was killed recently while ascending, without guides, a mountain in the canton of Valais, Switzerland. Dr. Hopkinson had received the degrees of M. A. and D. Sc., was a Fellow of the Royal Society, a member of the Institute of Electrical Engineers and a member of the Institute of Civil Engineers. He received, at different times, the Telford medal and Telford premium of the Institute of Civil Engineers for valuable contributions to science. To electrical engineers he is, perhaps, best known as the author of the "Hopkinson Method" of dynamo testing. He had intended starting for New York Sept. 28 on business in connection with a syndicate which he was forming for the purpose of developing some of his recent inventions.

MACHINERY AND TRADE.

Recent Inventions.

(Reported specially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for 10 cents.)

609,449—Aug. 23, 1898—Excavating Machine—G. J. Miller, Duluth, Minn. Assignor of one-half to J. A. Watterworth & M. Fee, same place. The device is provided with a vertically swinging boom. Mounted so as to slide along the boom is a scraping bucket which may be forcibly drawn outward along the boom by cables suitably connected with a windlass. Means is also provided for swinging the boom in the usual manner.

609,679—Aug. 23, 1898—Grader and Scraper—Calvin Karraker, Dongola, Ill. A longitudinally movable carriage carrying at each side a vertically swinging endless belt scraper.

610,180—Sept. 6, 1898—Apparatus for Melting Snow. J. B. Greening, Philadelphia, Pa. A portable oil-burning furnace into which snow may be shoveled.

610,550—Sept. 13, 1898—Road Grading Machine—J. V. Maxey, Mt. Vernon, Ill.

610,575—Sept. 13, 1898—Drawbridge—E. C. Ackers, Port Huron, Mich. Swinging gates are mounted in the approaches and connections made between these gates and the swinging draw by means of which the swinging of the draw will automatically open and close the gates.

Trade Notes.

The establishment of an asphalt plant, for use in repair work, is contemplated at Louisville, Ky.

The Phoenix Bridge company, Phoenixville, Pa., has been licensed to incorporate in Illinois.

The Barber Asphalt Paving company contemplates the erection of an asphalt paving plant at Leavenworth, Kas.

The Humboldt Brick Manufacturing company, Humboldt, Kas., has begun operations and is manufacturing vitrified paving brick.

The Trenton Fire Clay company, Trenton, N. J., has been incorporated to manufacture and sell vitrified and refractory clay products.

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The City Refuse Utilization company, Jersey City, N. J., has been incorporated to remove and utilize refuse by Herbert Tate, William W. Gooch and Henry W. Meen.

Japan produces annually about 600,000 barrels of Portland cement, worth there about $2 (gold) per barrel. About 10,000 barrels of natural cement is also produced.

The Ginzel Paving company has been organized at Wyandotte, Mich., for the purpose of laying cement walks by Capt. Ginzel, George B. Palmer and Mayor William Gartner.

Under the names of Last Chance, Nos. 1 to 10, inclusive, ten asphaltum claims have been located in Tie Fork of Spanish Fork canyon, Spanish Fork, Utah, by John Christensen, Wilborg Christensen. Albert Singleton and William Bird, sr.

Deposits of marl, valuable in manufacture of cement, have been discovered in Lake Maxinkuckee, six miles west of Argos, Ind. State Geologist Blatchley has had soundings made and the deposits thoroughly investigated and will make an analysis of the deposits.

The Higginsville Quarry company of Missouri, a recently organized corporation, composed mainly of St. Louis capitalists, has leased twenty acres of land of the Confederate Home association, at Higginsville, Mo., and will develop the asphalt, which has been found at a depth of thirty feet. Under the terms of the lease the company must pay to the home 52½ cents a ton for every ton taken out.

The International Correspondence schools of Scranton, Pa., have issued a "Brief Synopsis of Our Course in Telephony," which gives some idea of the great extent to which their methods of education by means of correspondence alone have been carried. From the outline of the course of study in telephone work it would seem that anyone who desired to fit himself to enter this important branch of electrical practice need only resolve to employ his spare time between other duties and he could, with resolution, equip himself quite as thoroughly as he could by a course of study in a technical school at a vast greater expense in both time and money. The course leads up from a study of the laws of acoustics through the historical stage of the telephone down to the present day practice in manufacture of the instrument, line construction, exchange or central office apparatus and all the many details which enter into the subject.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Macon, Mo.—A good roads asociation has been organized in this county.

Evansville, Ind.—The asphalt paving on Edgar-st., is about completed. It is the first asphalt street constructed in this city.

Utica, N. Y.—(Special.)—Joseph Kemper, assistant city surveyor, says that the Columbia Construction company has about completed Court-st. Besides Court-st. the company has contracts for three other streets, which will aggregate 12,780 sq. yds., making a total, including Court-st., of 36,000 sq. yds.

Dallas, Tex.—By a unanimous vote of the aldermen they voted to expend the sum to be derived from the 10 per cent. levy in improving the streets generally and especially those in the suburbs. Mayor Taylor advocated the plan of paving certain streets out of this fund and then expending the balance, about $13,000, for repaving one of the business streets.

Kansas City, Mo.—A large number of contracts for sidewalks, pavements, sewers, etc., are being held up, owing to a scarcity of brick, and as a result of this scarcity City Engineer Wise has requested the board of public works not to order any brick work for this year. City Engineer Wise has completed a table showing the amount of paving done so far during the fiscal year, as

Gloucester City, N. J.—Paving is proposed for Broadway. Cy. Clk.

Elizabeth, N. J.—The question of asphalt paving is being agitated.

Ashtabula, O.—Spring-st. will be paved with brick or asphalt blocks.

Montreal, Que.—The improvement of St. Catherine and Craig-sts. is contemplated.

Hamilton, O.—Macadam paving is contemplated for N. Third-st. O. M. Burns, cy. clk.

Providence, R. I.—Street work has been ordered by council that will cost about $58,000.

Oswego, N. Y.—Asphalt paving is contemplated for the intersection at E. First and Bridge-sts.

York, Pa.—Estimates have been submitted for constructing 133,915 sq. yds. of paving.

Elgin, Ill.—Brick paving is proposed for Milwaukee-st., from the railroad track to Spring-st.

Annapolis, Md.—Paving has been ordered for Randall-st., from Prince George to Market Square.

Mauch Chunk, Pa.—The question of issuing $40,000 bonds for street improvements will be voted on.

Plainfield, N. J.—Asphalt paving is contemplated for Park-ave. this year by the city council.

Newburg, N. Y.—The question of asphalt paving is being considered. Chas. Caldwell,

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Lincoln, Neb.—Ordinances were approved, Sept. 17, creating repaving districts Nos. 3 and 4. J. W. Bowen, cy. clk.

Schenectady, N. Y.—The aldermen will consider the question of paving Clinton and Union-sts. at their October meeting.

Waterloo, Ia.—The council has voted to pave with brick F-ave., First, Second, Bryant and N. Main-sts. and Wilbur-ave.

Toronto, Ont.—Asphalt paving is being considered for Major-st. by the board of public works; estimated cost, $27,290.

Scranton, Pa.—An ordinance will be introduced in the council for an appropriation of $68,000 for repairing paved streets.

Montgomery, Ala.—Brick paving has been ordered for Washington-st. at an estimated cost of $13,040. C. P. Hardaway, cy. clk.

Sioux City, Ia.—At the request of the contractor the contract for paving down town alleys has been canceled and new bids will be taken.

Springfield, Mass.—The improvement of a number of streets and the construction of sidewalks is recommended by the board of public works.

Newark, N. J.—Notice of intention has been adopted to pave Warren-st., from Norfolk to Bruce, with oblong granite blocks.

Athens, Ga.—An election to authorize the issue of $50,000 paving bonds is favored by the citizens.—W. W. Turner, clk. and trus.

Albany, N. Y.—A petition for brick paving for Rose-st., from Hamilton-st. to Madison-ave., has been favorably reported to the council.

Chicago, Ill.—The extension of Washington boulevard to Maywood, a distance of four miles, is proposed by the West Park commissioners; estimated cost, $600,000.

Richmond, Va.—Vitrified brick or other permanent paving material is being considered by the council as a substitute for the cobble stone paving on Sycamore-st.

Boston, Mass.—The board of aldermen has concurred with the common council in the loan order of $201,500, $132,000 of which is for street improvements.

Brooklyn, N. Y.—A resolution has been presented to the board of public improvements recommending asphalt paving for the streets surrounding the Norwegian hospital.

Norwalk, Conn.—The question of constructing about 7,000 sq. yds. of brick paving on concrete foundation is being considered, according to press reports. Chas. N. Wood, cy. engr.

St. Paul, Minn.—The board of public works is considering the preliminary order for paving Wacouta-st. The city engineer's estimates are: Granite, $5.70 per front ft.; asphalt, $5.

Anderson, Ind.—Petitions for asphalt paving on W. Twelfth-st. and asphalt or creosoted paving on W. Ninth-st., have been referred to the board of public improvements.

Patchogue, L. I.—The village trustees have passed a resolution that the properties adjoining the streets now paved be laid with sidewalks of stone, vitrified brick or granitoid.

Cicero, Ind.—Plans and specifications have been accepted by the town board for the improvement of East-st., and a sidewalk on the west side, between Jackson and Buckeye-sts. Surveyor Mitchell.

Washington, D. C.—Orders have been issued by the district commissioners to repair a large number of streets, by the burner method, cost chargeable to appropriation for repairs to streets, 1899.

Sharpsburg, Pa.—(Special.)—E. C. Hulbert, boro. engr., says $60,000 bonds will be issued for the purpose of repairing all cobble streets with wooden pavement. About 45,000 sq. yds. of this work will be done at once.

New Albany, Ind.—The committee on streets and alleys of the town of Silver Grove will give a hearing on Oct. 3 on the proposed improvement of Elkin-ave., from Silver-st. to the old State Run road, resolutions for which have been adopted.

Helena, Mont.—The city council decided Sept. 19 to construct stone cross-walks and ordered the board of public works to advertise for bids for them, and for the construction of granolithic pavement and stone gutter in front of the city hall.

Chicago, Ill.—The local board of improvements decided Sept. 21 upon paving a number of streets with asphalt, granite and cedar. A resolution has also been passed to pave with macadam, curb and gutter N. Forty-first-st., from Irving Park boulevard to Montrose-ave.

Pawtucket, R. I.—A joint resolution has been introduced in the common council appropriating $9,000 for paving Cottage-st. with asphalt. A resolution was passed in concurrence, appropriating $1,700 for the improvement of Prince-st., from Sabin to Greene. Prest. Jenks, of coun.

CONTRACTS TO BE LET.

New Brunswick, N. J.—Bids are asked until Oct. 3 for brick paving. John L. Jacques, cy. clk.

Stewart, Minn.—Bids will be received until Oct. 8 for grading a road. H. J. Heath, clk. Grafton twp.

Norwalk, O.—Bids are asked until Oct. 4 for constructing brick paving in Norwood-ave. F. W. Christian, cy. clk.

Troy, N. Y.—Bids are asked until Oct. 4 for grading and widening Mill-st. E. Ogden Ross, secy. contracting bd.

Oshkosh, Wis.—Bids will be received until Oct. 4 for curbing Thirteenth-st., from S. Main to Oregon. B. P. W.

Council Bluffs, Ia.—Bids are asked until Oct. 10 for asphalt and brick paving in certain streets. Cy. coun.

Deerfield, N. Y.—Bids are asked until Oct. 4 for improving the River road for 2¼ miles. C. W. Adams, state engr., Albany.

Cincinnati, O.—Bids are asked until Oct. 5 for granite paving and granite curbing in Delhi-ave. G. H. Spellmire, clk. B. C. A.

St. Louis, Mo.—Bids will be received until Oct. 7 for constructing granitoid sidewalks around St. Louis place. Pres't McMath, B. P. I.

Hoboken, N. J.—Bids are asked until Oct. 12 for asphalt paving in nine street, and for improving certain streets. M. V. McDermott, cy. clk.

Winnipeg, Man.—Bids will be received until Oct. 19 for paving Portage-ave., from Main to Hargrave-st., with asphalt. Acting Mayor Wilson.

Terre Haute, Ind.—Sealed proposals will be received until Oct. 18, for paving with brick and curbing two alleys. Wm. K. Hamilton, cy. clk.

Carthage, Ill.—Bids will be asked, according to press reports, about Oct. 15 for 25,000 sq. yds. of brick paving. M. P. Barry, prest. bd. local imp.

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Indianapolis, Ind.—Sealed proposals will be received until Oct. 3 for constructing cement sidewalks and improving certain streets. M. A. Downing.

St. Paul, Minn.—Bids will be received until Oct. 10 for macadamizing Rice-st., St. Paul, Bald Eagle and White Bear Lake roads. D. M. Sullivan, co. audt.

Madisonville, O.—Sealed proposals will be received until Oct. 6 for macadamizing, curbing and flagging Peabody-ave., from Central-ave. to Park-ave. Bennett Carter, vil. clk.

Wausau, Wis.—Sealed proposals will be received until Oct. 10 for macadamizing Franklin-st., from Main-st. to the C., M. & St. Paul railroad crossing. Chas. F. Beck, cy. clk.

Georgetown, O.—(Special.)—C. M. Gordon, county engineer, says the Shinkle, Ridge & Cedron road failed to sell on Sept. 3, as advertised, and it is re-advertised to be sold Oct. 11.

Atlantic City, N. J.—Sealed bids will be received until Oct. 3 for 42,086 sq. yds. of macadam, and 11,165 sq. yds. of vitrified brick paving on concrete foundation. Edward S. Lee, chrm. St. Pav. Com.

Terre Haute, Ind.—Sealed proposals will be received until Oct. 4 for improving Center-st., from Oak to Deming, and constructing concrete sidewalks on Tenth-st., from Sixth-ave. to Spruce-st. Wm. K. Hamilton, cy. clk.

Boonville, Ind.—Sealed proposals will be received until Oct. 20 for paving Third-st., from Locust to the L. E. & St. L. tracks, with standard macadam and curbing with Oolitic limestone. Chas. H. Johnson, town clk.

Cleveland, O.—Bids will be received until Oct. 5 for paving Ridge road, in Brooklyn twp. Julius C. Dorn, clk. bd. co. comrs. Sealed proposals will be received until Oct. 7 for repaving Pearl and Lorain-sts. with asphalt. Geo. R. Warden, Dir. Pub. Wks.

Toledo, O.—Bids will be received until Oct. 3 for paving Ontario-st., from Stickney-ave to Ash-st., with vitrified blocks on concrete, and until Oct. 10 for paving Sixth-st., from Main-st. to Kelsey-ave., with vitrified blocks on concrete. Lem P. Harris, cy. clk.

CONTRACTS AWARDED.

Malta, O.—The contract for brick paving has been awarded to W. J. Berry of Marietta for $8,630.

Beardstown, Ill.—The contract for laying a portion of Main-st. has been awarded to M. Murphy.

Westminster, Mass.—C. H. Kelliher, Newburyport, secured the contract for building a state road for $3,963.

Salem. O.—Davis & Caldwell, Youngstown, O., submitted the lowest bid for paving Lundy-st. with brick, for $4,392.26.

phalt Paving company secured the contract for asphalt paving in this city for about $35,000.

Marshalltown, Ia.—The contract for constructing cement walks was awarded to J. C. Dunn at 8 9-10 cts. a sq. ft.

West Hoboken, N. J.—The Barber Asphalt Paving company was awarded the contract for paving Clinton-ave. for $59,552.

Grand Forks. N. D.—The lowest bidder for 4 mls. of cedar block paving was P. McDonnell of Duluth. Minn.. at $1.06 a sq. yd.

Frankfort, Ky.—A contract for brick paving is said to have been awarded to the Gaffney Brick company of Winchester, Ky., for $15,000.

Ligonier. Ind.—The contract for brick paving was awarded to John W. I. Moran at 84 cts. for Massillon brick and 27 cts. a ft. for curb.

Albany, N. Y.—The contract for paving Elm-st., between Grand-st. and Delaware-ave., has been awarded to Mulderry Bros. for $32,079.

Rochester. N. Y.—The contract for paving N. Clinton-st. with asphalt was awarded to Whitmore. Rauber & Vicinus at $1.70 a sq. yd.; total, $78,000.

Webster. Mass.—The contract for paving Pleasant-st. with block was awarded Sept. 13 to Fred T. Ley & Co. of Springfield at $2.37 a sq. yd.

Bridgeport, Conn.—The B. D. Pierce, Jr., company was awarded the contract Sept. 16 to macadamize E. Main-st. at $1.56 a lin. ft.

Fremont, O.—The contract for paving W. Croghan-st. will be awarded to George Kinney, the lowest bidder. Trimble brick will be used.

Fargo, N. D.—The contract for constructing 71,000 sq. yds. of cedar block paving has been awarded to James Kennedy of this city at $1.06 a sq. yd.

Milwaukee, Wis.—John J. Crilley was awarded the contract for paving the upper end of Wisconsin-st. with Nelsonville brick on concrete at $1.59 a sq. yd.

Buffalo, N. Y.—The contract for surfacing Niagara-st., from Niagara Square to Porter-ave., has been adwarded to the Barber Asphalt Paving company for $33,097.

Cincinnati. O.—The David Folz Asphalt Paving company, city, secured the contract for paving, grading, etc., at the California pumping station for $109,382.

Marshall, Mo.—The contract for constructing 23,000 sq. yds. of macadam paving has been awarded to W. H. Kohlmeyer & Co. of Jefferson City, Mo., for $23,894.

Meadville, Pa.—Peter Schenck of Butler, Pa., was awarded the contract Sept. 14 for 1,480 sq. yds. of brick paving at $1.25 for Park wire-cut brick.

Denver, Col.—The Denver Paving company secured the contract for paving Champa-st., from Nineteenth-st. to Downing-ave., with

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Terre Haute, Ind.—William C. Miller secured the contract for constructing new concrete walks in N. Sixth-st. at 8 cts. a sq. ft., 31 cts. for curbing and $1.85 for granite corners.

North Braddock, Pa.—The contract for grading, paving and sewering Belle-ave. has been awarded to Ott Bros. of Pittsburg and J. H. McCready of Braddock for $20,000.

Buffalo, N. Y.—The contract for constructing 32,000 sq. ft. of marbleithic sidewalk around Humboldt park has been awarded to the Buffalo Marbleithic Paving company for about $6,000.

Des Moines, Ia.—The contract for paving Eleventh-st., from Forest-ave. to College-ave. with brick on broken tile concrete, was awarded Sept. 8 to J. W. Campbell at $1.39 1-10 a sq. yd.

Charleston, Ill.—H. C. Maltby, Lincoln, Ill., secured the contract for paving Nineteenth-st. at $1.33 a sq. yd. for Evansville brick, and 44 cts. a lin. ft. for stone curbing.

Toledo, O.—F. E. Cole was the lowest bidder for block paving in Knower-st., at prices ranging from $1.33 to $1.50, and in Rockingham-st. at $1.35 to $1.55, and for asphalt $1.52.

Keokuk, Ia.—Paving contracts were awarded Sept. 7 as follows: Brick paving, 5,761 sq. yds., Cameron & McManus, city, $1.35, or $9,392.79; macadam, MaManus & Tucker, city, 59 cts., or $6,080.82.

Tuckahoe, N. Y.—Bellew & Merritt Co. secured the contract for constructing telford macadam paving on Midland-ave. at $1.24, and Cronin Hill at $1.19 a sq. yd., and 50 cts. a lin. ft. for brick gutter.

Binghamton, N. Y.—(Special.)—H. Ward says the contract for paving Collier-st. was awarded to Eugene Fee of Olean, N. Y., at $1.97½ a sq. yd. Brick made by the New York Brick and Paving company will be used.

Logansport, Ind—Lux & Talbott, city, submitted the lowest bid for paving Third-st. with Clinton block, for $7,125.90, and for paving Sycamore-st. with Terre Haute brick for $14,802.09. Asphalt filling will be used.

Joliet, Ill.—J. C. Regan submitted the lowest bid Sept. 5 for paving Washington-st. with brick, as follows: Galesburg brick, $1.19; Streator, $1.17; curbing, 38 cts.; excavation, 30 cts.; resetting old curb, 10 cts.

Terre Haute, Ind.—Contracts for constructing roads have been awarded as follows: Paris road, Jean, Jean & Haxton, Worthington, Ind., $5,000; National road, $3,263, and Darwin road, $6,739, Fred S. Jessup, Worthington.

Lincoln Neb.—The Barber Asphalt Paving company has been awarded the contract to repave Eleventh-st. with asphalt at $2 a sq. yd. The contract for paving O-st. was held up by an injunction suit brought by O. N. Humphrey.

Chester, Pa.—George Wiegand has been awarded contracts for relaying the asphalt blocks on Seventh-st., which have been torn up to relay tracks and switches, and to relay the blocks on Seventh-st. after the tracks have been put down.

Coshocton, O.—Bids have been received for paving Main-st. as follows: N. G. Abbott, Columbus, O., $27,758; Adams Bros., Zanesville, O., $24,648; J. N. Kissner, Warsaw, O., $20,647; C. B. McArthur, Kenton, $25,019; Townsend & Co., Zanesville, $30,764.

Cincinnati, O.—The contract for the repair of Fairfield, Auburn and Gholson-aves., Fifth-st. and Garfield-place, was awarded to the Warren-Scharf Asphalt Paving company, and McMillan and Findlay-sts. to the David Folz Asphalt Paving company. The contracts are for a period of five years.

Columbus, O.—Bids were received Sept. 22 for improving Yale-ave., from State to Broad-st. The bid of N. B. Abbott was the lowest submitted, and it was only about $10 lower than that of Wm. H. Luchtenberg, while that of S. A. Sullivan was but a little higher.

Monroe, Ala.—Bids were received Sept. 8 for brick paving on concrete in Desiard-st., from the Coaldale Brick and Tile company, Coaldale, Ala., Coffeyville Vitrified Brick company, Coffeyville, Kas., Talbott Paving company, Shreveport, and Tennessee Paving company, Memphis. The awarding of the contract was deferred.

Allegheny, Pa.—The lowest bid received Sept. 6 for paving Pennsylvania-ave. with asphalt was $2.25 a sq. yd., which was 40 cents higher than the lowest bid received two months before for asphalt paving. The committee on public works rejected the bids and ordered the director of public works to readvertise.

Youngstown, O.—Bids were received Sept. 13 for paving Scott-st. as follows: Barber Asphalt company—Excavation, 12 cts.; curb, 40 cts.; cement curb and gutter, 59 cts.; paving complete, $1.84. Assyrian Asphalt company—Excavation, 25 cts.; curb, 38 cts.; cement curb and gutter, 50 cts.; paving complete, $1.74.

Omaha, Neb.—Paving contracts have been awaraded to the Grant Paving company as follows: Sept. 3—Poppleton-ave., from Park-ave. to Thirty-second-st., $1.26 a sq. yd. Sept. 10—Twenty-fourth-ave., from Harney-st. to St. Mary's-ave., asphalt, $1.43. Sept. 17—Thirty-second-ave., from Hanscom park to Dorcas-ave., asphalt, $1.45.

Syracuse, N. Y.—Bids were received Sept. 19 for paving the roadway in front of Porter school, from Emerson-ave. to Bridge-st., with asphalt or asphaltina, as follows: Empire Contracting company, Alcatraz asphalt, $1,700.10; Columbia Construction company, Trinidad asphalt, $1,676.70; Asphaltina Construction company, asphaltina, $1,683.20.

Baltimore, Md.—The municipal board of awards rejected all proposals submitted for repairs to streets as being too high. The bids ranged, for repairs to streets, from $3.98 to $4.18 a sq. yd., while new asphalt pavements are laid at a cost of from $1.52 to $1.59 a sq. yd. The work will be done by day labor and the material purchased by the commissioner's department.

Portland, Ore.—The Trinidad Asphalt Paving company was awarded contracts, Sept. 3, for paving Fifth-st. with Trinidad asphalt, $1.64 a sq. yd., or $2,543.57; and Alder-st. at $1.64 or $15,341.71. Smyth & Howard were awarded contracts for new sidewalks, crosswalks and box and stone gutters on Hawthorne-ave., for $2,754.41, and Nickum & Kelly, one block and a half and intersection for $572.70.

Indianapolis, Ind.—The contract for paving Tenth-st., from College-ave. to Bellefontaine-st. with asphalt was awarded to the Western Paving and Supply company at $4.27 a ft. on each side. Contracts for cement sidewalks were awarded at the follow-

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ing prices: J. C. Veney, 75 and 37 cts.; Daniel Foley, $1.30; S. F. Herron, $1.15; Capitol Paving and Construction company, $1.18; C. M. Kirkpatrick, $1.17.

Chicago, Ill.—The contracts for paving N. Clark-st., between Division-st. and North-ave., and N. State-st., between Kinzie and Division-sts., with asphalt, were awarded, Sept. 20, to the Barber Asphalt company at $2.15 a sq. yd. Contracts for boulevarding Oakley-ave. were awarded, Sept. 16, as follows: Sackley & Peterson, 23,100 sq. yds. asphalt, $1.91 a sq. yd.; catch basins, catch basins rebuilt and repairing manholes, $45,-396. John Sargent, 16,270 sq. ft. concrete sidewalk, $2,115 and 12,620 ft. curbing $6,089.

Detroit, Mich.—The contract for paving Second and Montcalm-sts. was awarded, according to press reports, to the Alcatraz Constructing company at $1.81 a sq. yd., which is the lowest asphalt bid ever submitted in this city. Other contracts awarded are as follows: Atwater and Rivard-sts., brick, Sheehan & Co.; Cass and First-sts., Currie & Co., at prices averaging $1.58 a sq. yd. The mayor, however, vetoed the contract for paving Atwater-st. Contractor Stevens secured a contract, Sept. 20, for laying 74,000 Waynesburg brick, and Holmes, Strachan & Co. 54,000 Hallwood block.

Quincy, Ill.—Bids for paving Second-st., from Broadway to Vine, were received, Sept. 15, as follows: Peter Simons—Paving, 89 cts. a sq. yd.; excavating, 23 cts. a cu. yd.; rock excavation, $1.50 a cu. yd.; curbing, sewer pipe, catch basins and seven iron crossings, $2,057.50. Henry Rees—Paving, 86½ cts.; excavating, 18 cts.; curbing, sewer pipe, catch basins and seven iron crossings, $2,019. Contracts were awarded, Sept. 17, for paving alleys with brick as follows: Donation alley, $1.11¾; Mulberry alley, $1.09½, and Peach alley, $1.15, Peter Simons; Jail alley, $1.08½, and Jessamine alley, $1.11, Henry Rees.

New Orleans, La.—The council rejected Sept. 6 the bids for asphalt paving in Canal-st. The specifications called for bids for paving the entire street, including the neutral ground, on which four or five street railway tracks run the entire distance. While the bids were under consideration an attempt was made by the city authorities to make some arrangement with the railways by which the paving of the neutral ground could be carried on simultaneously with the rearrangement of their tracks. This fell through, and the railways threatened to carry the matter to court. The council then decided to reject the bids. The contracts for paving Claiborne and Camp-sts. were awarded as given in the September number of Municipal Engineering.

Kansas City, Mo.—The board of park commissioners awarded the contract Sept. 7 for laying cement sidewalks on Benton boulevard to the Kansas City Stone Sidewalk company at 22 cts. and the contract for curbing and guttering to Buntin, Shryer & McGannon at $1. Contracts were awarded Sept. 12 as follows: Monroe-st., asphalt, Gil-17½ and 15 cts.; M. Schoonmaker, 15.49 cts; J. J. Armstrong, 15½ cts; Portland Paving company, 15¾ cts.; Missouri Sidewalk company, 15 and 15½ cts.; Bandera Flagstone company, 18 cts.

SEWERS.

Cohoes, N. Y.—The prize for the best sewer plan of those submitted was awarded to the one signed I X L, in accordance with the recommendations of the expert of the commission, Palmer C. Ricketts of Troy, N. Y.

Louisville, Ky.—Damage suits have been filed against the city by twenty-one property-owners, who claim that their property has been damaged as a result of overflows, due to a defective sewerage system. The total amount sued for is $26,650.

Stratford, Ont.—An investigation has begun into the complaints by the board of health of the township of Downie against this city for alleged pollution of the River Avon by draining the city sewage into the river. Much evidence has been given to the effect that while years ago the water was pure and clear, it is now filthy and slimy.

San Rafael, Cal.—Considerable trouble has arisen over the proposed construction of the gravity sewerage system, owing to the fact that after plans and specifications for a stone gravity system were submitted, and $26,000 voted and sold at a premium of $1,916, the town trustees are about to change the plans and substitute wooden mains for ironstone pipe, as provided in the original plans.

New Orleans, La.—The newly appointed sewerage commission held its first session Sept. 20 and framed a set of propositions to be submitted to the franchise holders. The councilmen hope to base some satisfactory solution of the question upon the answer. City Chemist Metz urges the immediate necessity of the system and says its introduction will decrease the death rate. The commission consists of Chairman Story and members Dreyfus, Ricks, Claiborne, Tesso and Moran.

CONTRACTS TO BE LET.

Oshkosh, Wis.—Bids will be received until Oct. 4 for constructing sewers. Bd. Pub. Wks.

Mobile, Ala.—Bids will be received until Oct. 17 for constructing a sewerage system. J. C. Brush, mayor.

Marietta, O.—Bids are asked until Oct. 15 for sewers in Fifth Sewer District. Carl Becker, cy. clk.

Cohoes, N. Y.—Sealed proposals will be received until Oct. 12 for constructing sewers. Mayor Mitchell.

Benson, Minn.—Bids are asked until Oct. 7 for constructing a sewer in Utah-ave. Anthon Arneson, vil. rec.

Troy, N. Y.—Bids will be received until Oct. 12 for constructing sewers. E. Ogden Ross, Secy. Pub. Imp. Com'n.

Grand Forks, N. D.—Sealed proposals will be received until Oct. 8 for the construction of 940 ft. of pipe sewers. F. A. Brown, cy.

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premiums will be $250, $150 and $100 respectively. T. E. Harland, Chaldecott, clk.

East Cleveland, O.—Sealed proposals will be received until Oct. 10 for the construction of a sewage purification plant and for sewers in a number of streets. H. B. Chapman, vil. clk.

White Earth, Minn.—Sealed proposals will be received until Oct. 4 for the construction of a sewerage and water works system on White Earth Reservation. John H. Sutherland, U. S. Indian Agt.

CONTRACTS AWARDED.

Kansas City, Mo.—Michael Walsh was awarded a sewer contract Sept. 12 for $38,878.70.

Fargo, N. D.—The contract for constructing two miles of sewers has been awarded to James Kennedy, city.

Clinton, Ind.—The contract for constructing a 12-in. sewer has been awarded to J. Robertson of Terre Haute.

Delray, Mich.—The contract for constructing 8,745 ft. of sewer has been awarded to James Grant for $6,000.

Detroit, Mich.—Langley & Jeynes secured the contract Sept. 19 for constructing a new brick sewer for $2,880.

Reedsburg, Vt.—The contract for the Market sewer was awarded to John G. Schuster at 41 cts. a ft.

Iowa City, Ia.—Thomas Hanlon secured the contract for constructing a sewer in alleys of blocks 1 and 9 for $581.10.

Mexico City, Mex.—The contract for sewering the entire city has been awarded to Vesion & Letellier of Paris, France.

Mansfield, O.—Lomax & Hamblin secured contracts Sept. 20 for constructing the Lexington-ave. and E. Johns-st. sewers.

Havana, Ill.—The contract for constructing the sewerage system was awarded to H. G. Bruning, city, for $4,889.75.

Beaver, Pa.—The contract for constructing 4,100 ft. of sewer was awarded to Logan & Shuster, Rochester, Pa., for $4,038.

Billings, Mont.—The contract for building a sewerage system has been awarded to T. R. Hinds & Co. of Butte for $14,000.

Menasha, Wis.—The contract for the Park-st. sewer, 1,760 feet, 12-inch pipe, was awarded Sept. 20 to Patrick Hyland for $602.48.

Savannah, Ga.—The contract for constructing the house drainage system was awarded to Miles & Bradt, Atlanta, for $151,170.90.

Anaconda, Mont.—J. A. Hasley was awarded the contract for constructing sewers in districts Nos. 9 and 12 at $850 and $1,140 respectively.

Richmond, Ind.—John F. Cronin, city, secured the contract Sept. 15 for building the intercepting sewer at $3.67 a lineal foot, or $9,200.

Milwaukee, Wis.—John J. Crilley has been awarded the contract for building the sixth section of the Thirtieth-st. tunnel sewer for $65,528.30.

Crafton, Pa.—Bids were awarded Sept. 20 for constructing 5,140 feet of 8 to 30 inch pipe sewers. The bids ranged from $5,792.68 to $9,051.68.

Oakmont, Pa.—The contract for constructing the sewerage system was awarded Sept. 12 to John Dell and Diulles & Bro., Braddock, Pa., for $36,500.

Shelby, O.—The lowest bid submitted Sept. 19 for building 6½ miles of lateral sewers was that of De Groodt Bros. of Youngstown—$17,000.

Pocomoke City, Md.—The contract for building a sewerage and water works system was awarded Sept. 15 to Van D. Hitesmith, Knoxville, Tenn., for $19,500.

Faribault, Minn.—The lowest bid submitted for building a sewer was that of O'Neil & Son, city, at $9,337, and the highest Engel & Osman, Duluth, at $15,073.

Carbondale, Pa.—The contract for constructing 8-inch sewers on Terrace Wyoming and Washington-sts. and Ninth-ave. was awarded Sept. 7 to John Nolam at 97 cents a lineal foot.

West Newton, Pa.—The contract for furnishing 850 ft. of 24-in. sewer pipe was awarded to the Sharon Sewer Pipe Manufacturing company, Sharon, Pa., and the contract for laying the sewer to Christ Goehring, city.

Toledo, O.—The contract for constructing the Adams-st. sewer was awarded Sept. 15 to Jas. McKinney for $35,285. H. P. Streicher was the lowest bidder Sept. 19 for a 15-in. sewer in the alley between Utah and Yondota-sts., at $936.

Newark. N. J.—The contract was awarded Sept. 22 for a sewer in the annexed district on Clinton-ave.. Headley & Christie, $17,180.75. Bids were received for twelve lateral sewers to connect with the intercepting sewer "Down Neck," but action was postponed for one week.

CONTEMPLATED WORK.

Butte, Mont.—An extension of the Holland-st. sewer has been ordered.

Phoenix, Ariz.—The estimated cost of a sewerage system is $119,000.

Chesapeake City, Md.—The council has voted to build a sewerage system.

Springfield, Mass.—Orders for the construction of sewers have been passed.

Washington, D. C.—Hearings will be given Oct. 5 on the proposed stoneware sewers.

Steubenville, O.—Plans and specifications for sewers have been made by the city engineer.

Chestertown, Md.—The sewerage system is being investigated by the state board of health.

Brookfield, Mo.—This city has voted in favor of the construction of a sewerage system.

Greenville, O.—Ordinances for constructing sewers have been passed. Engineer Beers.

Decatur, Ala.—The construction of a small sewerage system is contemplated. J. E. Edwards, cy. clk.

Santa Ana, Cal.—Contracts for constructing the interior system of sewers will be let in October.

Cicero, Ind.—Specifications have been submitted for constructing sewers. Surveyor Mitchell.

Chester, Pa.—An ordinance for a sewer in Fourth-st. has been approved by Mayor C. M. Black.

Toronto, Ont.—Dr. Sheard, medical health officer, favors a complete filtration system of sewerage.

Spokane, Wash.—The council has ordered a sewer on Pacific-ave., from Spruce to Coeur d'Alene-ave.

Niles, O.—Bids will probably be asked in October for building a sewer one mile long. Wm. Wilson, cy, engr.

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East Hartford, Conn.—A consulting engineer will be employed on the proposed trunk sewer.

Wayne, Mich.—The council will secure a surveyor to make surveys for the proposed sewer.

Lyons, N. Y.—The proposition of constructing a sewer on Jackson-st. has been favorably voted on.

Lebanon, O.—The construction of a sewer on Mulberry-st is contemplated. F. M. Hamilton, jr., mayor.

Greenville, Pa.—An ordinance has been passed authorizing the advertising of bids for a new sewer in the Third ward.

Granite City, Ill.—The question of constructing a joint sewerage system is being considered by this city and Madison.

Galesburg, Ill.—A trunk sewer from the Knoxville road to Cedar Fork creek is proposed. M. J. Blanding, cy. engr.

Vicksburg, Miss.—A committee was appointed Sept. 13 to make plans and estimates for a sewerage system for this city.

Monmouth, Ill.—The construction of 6,490 ft. of 12, 15, 42, 24-in. brick sewers is contemplated. M. J. E. Miller, cy. engr.

Berkeley, Cal.—The construction of a sewer on Sixth-st., between Rose and Gillmansts., has been recommended by St. Supt. Rowell.

Newburg, N. Y.—The construction of seven blocks of 4-ft. brick sewer, at a cost of $27,000, is contemplated. Chas. A. Caldwell, cy. engr.

San Francisco, Cal.—Plans for a sewerage system adjoining the Presidio reservation on Lyon, Devisadero and adjoining streets have been recommended by the Supervisors' Street Committee. The plans are for a brick oval form sewer, three feet high, provided with a vitrified stone lining set in cement against the bricks and conforming to the oval bottom. It is believed that this lining will cause the brick sewers to last for many years.

WATER-WORKS.

Elyria, O.—The city has purchased the water works plant of the Elyria Gas and Water company for $45,460.48.

Des Moines, Ia.—The proposition to purchase the local water works plant for $350,000 was defeated.

Chattanooga, Tenn.—The new filtration system of the City Water company was put in operation Sept. 15. The system cost $100,000.

Anaconda, Mont.—A suit involving the ownership of the Pocatello water works has been filed by F. D. Towns and J. J. Cusick against James A. Murray.

Boyertown, Pa.—The Boyertown Water company has filed a bill of equity against this borough, asking that it be restrained the United States court and Henry A. Woolery, special master. has been instructed to execute a deed for the plant to James D. Showers, the purchaser.

Fulton, N. Y.--William R. Hill, M. Am. Soc. C. E., Syracuse, N. Y., has been selected by the water commissioners and George A Clark, Oswego, N. Y., has been engaged by the Fulton Water Works company as experts in the proposed sale of the works to the city.

Kansas City, Mo.—The board of public works has decided to recommend to the city council an ordinance providing a special water rate of 5 cents per 1,000 gallons to all consumers using 10,000,000 gallons each month, and 4 cents for those using 25,000,000 gallons.

Augusta, Me.—A bill, which embraces a plan to unite several municipalities for the purchase of a water supply, will be presented to the next legislature. The purpose of the bill is to unite the towns of Benton, Fairfield, Winslow and Waterville under what shall be known as the Kennebec water district.

Groesbeck, Tex.—The citizens voted to authorize the city council to transfer as a gift to Rod Oliver the entire water works system belonging to this city and worth $13.000 or $14.000. Mr. Oliver, under bond, places himself under obligation to keep it in good order and to maintain and continue to families, business houses, etc., the same rates as charged by the city.

Birmingham, England—The water supply is to be increased upon plans drawn by Jas. Mansergh and Corporation Engineer Gray. Storage dams will be built, storing about 18,000,000 gals. of water and supplying 27,000,000 gals. per day. The plans contemplate a tunnel 6,600 ft. long, leading from one water shed to the other. The estimated total cost is $29,255,000.

Brooklyn. N. Y.—According to a recent report by James Moffett, deputy commissioner of water supply of the borough of Brooklyn, the addition and improvements needed will reach a total cost of $2,900,000. Insufficient conduit capacity has resulted in a waste of millions of gallons of water east of Millburn. and the pumps have often been kept idle, while at other times they are under a great strain. An additional reservoir is contemplated at Forest Park at a cost of $600.000. and filter beds at Baisley's at a cost of $75.000.

Racine. Wis.—The Boston Safe Deposit company, owner of the Racine water works, has asked the United States court for an injunction restraining the city of Racine from destruction of the property. The franchise under which the Racine Water Works company operates expires in 1902, and then the city may purchase. the price to be fixed by arbitration. It is claimed that the citizens

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until Oct. 4 for constructing a water works system. John H. Sutherland, U. S. Indian Agt.

Coburg, Ont.—Separate bids will be received until Oct. 31 for a water supply and street lighting system. D. H. Minaker, town clk.

Osage, Ia.—(Special.)—Bids will be received until Oct. 6 for constructing a water works system. I. P. Williams, chrm. water com.; G. H. Merridith, Cedar Rapids, engr.

Eaton Rapids, Mich.—Bids are asked until Oct. 4 for 6 miles of cast iron water pipe, with special castings, hydrants, valves and valve boxes. Jas. H. Gallery, secy. bd. w. w. and elect. light.

Dayton, O.—Bids will be received until Oct. 3 for the construction of the flood gates across the Miami and Erie canal at Apple-st. and setting of gate and construction of necessary masonry at the west end of the Apple-st. sewer. John L. Baker, prest. bd. cy. affairs.

Seattle, Wash.—Bids will be received until Nov. 15 for constructing certain additions to the existing water works system, including a gravity water supply from Cedar River, reservoirs and portions of an auxiliary high service system. Frank Oleson, secy. B. P. W.

CONTEMPLATED WORK.

Perham, Minn.—Plans have been prepared for a water plant.

Sioux Falls, S. D.—A municipal water works system is contemplated.

Irvington, N. Y.—The question of extending the water works will be voted on.

Verdun, Que.—Plans are being made for a water works and sewerage system.

Augusta, Me.—The construction of a reservoir is contemplated. Wm. G. Williams, supt. w. wks.

Water works systems are being agitated at the following places: Williamsport, Md.; Mankato, Minn.

Mabel, Minn.—Petitions have been circulated asking the village council to extend the water mains.

Des Moines, Ia.—The city council has ordered the extension of the water mains in a number of streets.

Centerville, Md.—The question of securing a better water supply is being considered by the town commissioners.

Depew, N. Y.—The question of securing a municipal water supply from Lake Erie is contemplated. Henry W. Box.

Pasadena, Cal.—The question of acquiring a municipal water works system will probably be submitted to a vote.

Reading, Pa.—The question of making a loan for a filtration plant will probably be voted on in November.

Philadelphia, Pa.—The plans for the filtration of the city's water supply will be ready to submit to the councils Oct. 1.

Holyoke, Mass.—An open sand filter, having a capacity of 500,000 gals. a day, has been designed for the water works.

Monroe, La.—The question of issuing bonds for water, sewerage and electric light plants is said to be under discussion.

McKees Rocks, Pa.—The council has decided to make preliminary preparations for the erection of a municipal water works system.

Bradford, Pa.—An ordinance has been ordered published, authorizing the construction of a storage reservoir of 92,000,000 gals. capacity.

Water works bonds have been favorably voted on as follows: Bainbridge, N. Y.; Clare, Ia.; Elmore, Minn.; Condon, Or.; McConnellsville, O.; Jackson, O.

Somerville, Tenn. — (Special) — W. D. Scraggs says $10,000 bonds for a water and light plant have been voted and the contract will be let in the near future.

Baltimore, Md.—The board of public improvements considered the ordinance providing for the construction of filtration plants for the purification of the city's water supply, Sept. 16, but reached no conclusion.

Little Falls, Minn.—A special election will be held Oct. 4 to vote on the proposition to issue $60,000 bonds for the purchase of the present water and electric light plant or for the construction of a new plant.

The question of issuing bonds for water works construction will be voted on as follows: Atlanta, Ga., Oct. 5; Richfield, Utah; Persia, Ia.; San Mateo, Cal.; Mt. Sterling, Ky.; Little Falls, Minn.; Topeka, Kas.

Pueblo, Col.—C. P. Allen, Denver, Col., recommends that a 34-in. wood suction pipe be laid from the pumping station to the reservoirs alongside of the 24-in. cast iron suction pipe already in use. He also recommends more boiler power.

The construction of water works systems is contemplated at the following places: Conneautville, Pa.; Fayetteville, Tenn.; Siddell, Ill.; Whitehall, Ill.; Carson, Ia.; Lakeport, Cal.; Thornton, Ind.; Lewisville, Ind.; Wynne, Ark.; Oto, Ia.

Moline, Ill.—(Special)—Jacob A. Harmon, C. E., Peoria, Ill., has prepared preliminary plans, estimates and report on a water supply improvement. The plans contemplate the construction of natural or slow sand filters having a capacity of 3,000,000 gallons per 24 hours, a distribution reservoir of 5,000,000 gallons, two settling basins of 2,800,000 gallons each, a water tower and tank which has a capacity of 185,000 gallons, a pumping station and about $15,000 or $20,000 worth of mains. It is expected that detail plans and specifications will be ready in January, 1899.

Water Works Contracts Awarded.

Breckenridge, Col.—The contract for constructing a water works system has been awarded to D. Mitchell for $21,400.

Mobile, Ala.—The contract for building the water works system was awarded Sept. 13 to M. T. Lowman & Co. of Louisville, Ky., for $448,747.21.

Albany, N. Y.—The contract for the improvement of Bleecker reservoir was awarded Sept. 20 to E. M. Haines & Co, Rhinebeck, N. Y., for $28,456.

York, Pa.—The York Water company has awarded a contract to the New York Filter company for a filter plant, with 4,000,000 gallons capacity a day, for $100,000.

Wyoming, Ia.—The contract for building the water works system has been awarded to J. L. White of Leonore, Ill., for $2,577.

Columbus, O.—Bids were received Sept. 10 for constructing the proposed dam in the Scioto. The specifications required 5,000 cubic yards of dry earth excavation, 3,500 cubic yards of wet earth excavation, 1,200 cubic yards of rock excavation, 20,000 cubic yards of concrete masonry. The specifications provided, however, for bids on concrete masonry, one bid to include cement and the

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other without cement. The bids were as follows: William H. Luchtenberg, with cement, $100,775; without cement, $60,775; Willard & Conwell, with cement, $101,000; without cement, $57,200; S. Casparis, with cement, $127,000; without cement, $46,000; Cleveland Construction company, with cement, $115,300; without cement, $75,300; Greenville Construction company, with cement, $118,450; without cement, $67,350; Houston Construction company, with cement, $118,450; without cement, $65,850; Assurance Construction company, with cement, $114,400; without cement, $62,400. The lowest bid with cement was that of W. H. Luchtenberg, $100,775, and without cement S. Casparis, $46,000.

GARBAGE DISPOSAL.

Santiago, Cuba—The contract for building a garbage plant has been awarded to the Dixon Crematory company.

Milwaukee, Wis.—The aldermen have voted to purchase a garbage plant of the Engle Crematory company for $52,500.

New Orleans, La.—A resolution has been adopted directing the city engineer and commissioner of public works to prepare plans and specifications for the erection of crematories.

Atlantic City, N. J.—The contract for building a Smith-Simon incinerating plant has been awarded to Thomas K. Dalzell, Reading, Pa., for $29,900.

Bridgeport, Conn.—The proposition of Frank E. Clark, president Connecticut Reduction company, to sell the garbage plant to the city, has been rejected.

Phillipsburg, N. J.—The council has voted to build a garbage plant at a cost of $8,500.

Beaver Falls, Pa.—The Keystone Reduction company secured a five-year contract for removing garbage, etc.

Boston, Mass.—The City Refuse Utilization company has been awarded the ten-year contract for disposing of the combustible city refuse. The city retains the option of buying the plant under appraisement at the end of five years.

Syracuse, N. Y.—The block system of street cleaning will be inaugurated for cleaning the paved streets.

Hamilton, O.—The International Sweeping company, Dayton, O., has offered one of their "Pick-up" street cleaning machines to this city for $475.

St. Paul, Minn.—In the annual report of L. W. Rundlett for 1897 the cleaning of asphalt pavements by hand is given considerable attention.

Albany, N. Y.—The contract for removing [illegible] awarded recently to Jas. E. Deegan

tional street sprinklers is urged by A. M. Eaches, st. comr.

Evansville, Ind.—The contract for sweeping the streets for one year has been awarded to Frank Pritchet at 18 cts. per 10,000 ft.

Marion, Ind.—Plans for rebuilding the burnt garbage disposal plant are being considered.

Denver, Col.—A better method of garbage disposal is desired. Dr. Munn and Supt. Clark of bd. of health.

BRIDGES.

Decatur, Ill.—The Wrought Iron Bridge company, Canton, O., was awarded the contract Sept. 17 for building an iron bridge over Sandy creek, near Shady Grove, for $960.

Chehalis, Wash.—Bids are asked until Oct. 10 for constructing a trestle over the Chehalis river. Albert Schooley, co. audt.

Pekin, Ill.—The Wrought Iron Bridge company, Canton, O., has been awarded the contract for a bridge across the county ditch in Malone twp.

Wichita, Kas.—The construction of a bridge across the Little Arkansas, east of Griswold Park, is contemplated.

Ansonia, Conn.—A brick bridge will be built. Creosoted block will be laid first and covered with two layers of tarred felt. A cushion of sand 1 in. thick will be spread and the bricks set on it.

Burlington, Kas.—Bids are asked until Oct. 4 for three steel bridges. D. K. Swearingen, co. audt.

Waverly, Ia.—Bids are asked until Oct. 3 for a steel bridge over Cedar river. W. Weidilschka, co. audt.

Carpentersville, Ill.—The construction of a steel bridge across the river is contemplated.

Cincinnati, O.—Bids are asked until Oct. 20 for constructing the superstructure and masonry substructure for viaduct over Lick run.

North Baltimore, O.—Bids are asked until Oct. 8 for building a bridge across the Great Miami river. E. L. Lewis, co. audt.

Parker, S. D.—Bids are asked until Oct. 11 for building three steel or combination bridges. Co. audt.

Colfax, Wash.—Bids will be received until Oct. 7 for building a steel or combination bridge across the North Palouse and Union Flat creek. Bd. co. comrs.

STREET LIGHTING.

Braddock, Pa.—A municipal lighting plant is urged.

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Municipal Engineering

VOLUME XV. NOVEMBER, EIGHTEEN NINETY-EIGHT. NUMBER 5.

THE WORK OF MUNICIPALITIES.

THE SUBJECTS CONSIDERED AT THE FIFTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS IN WASHINGTON, D. C.

The fifth annual convention of the American Society of Municipal Improvements assembled in Washington, D. C., on October 26, and was opened with an address of welcome by President Wight, of the Engineer Commission of Washington, to which President Harrison Van Duyne responded. In referring to the great events of the year, he said:

The general government has had a severe experience this year with the dangers arising from assembling large bodies of men together, and has found that the best possible sanitary arrangements must be made to protect their health. People crowd into our cities, and the members of this society, representing, as they do, the governing and working power of so many cities, have a special responsibility resting upon them. Are the streets and avenues of your city in good condition, and are they kept clean? Is your city properly sewered, and have you a water supply uncontaminated and kept in such condition that your health and that of your families is not endangered by drinking it? In answering these questions, we realize how much the health and comfort of the hundreds of thousands of people we represent is placed in our care.

We come together once a year to listen to the reading of carefully prepared papers by some of our members on the various subjects relating to city improvements, and in the discussions which follow the actual experience of the different cities is clearly brought out, but in addition to that, the visits made by us each year to a different one of our larger cities, enabling us to study on the ground the best work done in each, give us all an experience and training that must be of great advantage to the city we represent.

Our first meeting was held in Buffalo, probably the first city in this country to decide that smoothly paved and clean streets were a necessity; and its citizens and officials must have had the courage of their convictions to show by their example what a progressive city could do.

Three years ago we met in Cincinnati, an ideal convention city, built on its seven hills, its incline planes and stationary engines making easy access to their very top. Miles of finely paved streets and its extensive sewer construction showed it to be another of our very progressive cities, and in its hospitality it could not easily be excelled.

Two years ago we were in Chicago, that marvel of the west, with its beautiful parks and fine suburban drives. To improve its sewer system it has not hesitated to change the course of a river, and some day it will be at the head of navigation of the Mississippi.

Last year we were at Nashville, Tenn., a city with energy enough to successfully carry on a great exposition, and which will easily in its improvements rank as one of the foremost cities of the south, and this year we come to the National Capitol, the city in which we all feel a personal interest and a special pride, and in passing through its finely paved streets and avenues, and in admiring its beautiful parks and public grounds, we fully realize that thoroughly trained and conscientious men are at the head of the public work in Washington.

Mr. Van Duyne spoke of the application to his own city (Newark, N. J.) of some of the lessons at the Nashville convention, mentioning particularly the recommendation of the committee on street paving, that where a contractor was required to guarantee his work for a term of years, the condition of the pave-

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ment at the end of the term should be specifically stated. Newark now requires a ten-year guarantee under bonds given by a responsible trust company and the exact condition in which the pavement is to be at the end of that term is stated. The price of asphalt paving in Newark has declined, he stated, from $2.85 per square yard in 1894, to $2.35 last year, and $1.50 this year, but the city agrees to pay in addition 25 cents per yard for the second term of five years for maintenance and repairs. A first year guarantee on oblong granite block pavement is required, notwithstanding which the price has been reduced from about $2.50 per yard in 1893 to $1.50 this year, when laid on sand and in like proportion when laid on concrete. "Perhaps I should add," he explains, "that New York City, only nine miles away, stopped almost entirely its paving work this year and that may have helped to reduce the price to neighboring cities." Continuing, he said:

In all our progressive cities—and we all want to be considered progressive—the conditions are now entirely different from fifteen years ago. Even Washington at that time or a little earlier had an unenviable reputation for the condition of its streets, and a number of other cities gloried in their cobblestone pavements. But the great advance made during the last few years in city development has taken a large amount of money, the annual outlay for expenses has been greatly increased, municipal bonds are becoming a burden, and as a natural result there is such an increase in the tax rate as to cause alarm to many citizens. During this same time in all our cities a wonderful advance has also taken place in the value of the franchises which have been given to so many companies, to use the public streets to carry on their business.

These franchises are worth nearly as much as the land fronting on the streets through which their grants and privileges extend. They have a recognized value to [illegible] the public burdens that properly belong to them, and the tax burdens of others are proportionally increased. I know of no reason why, according to the true value of these properties, they should not contribute their share to the support of the public schools, to the cost of maintaining our courts and all the other expenses of city and state government the same as other property. True, in nearly all cases these franchises were given away as if they had no value, but is that any reason why, after their enormous value is fully established, they should not be treated as other property and annually contribute their full share to the tax collector?

Beyond our churches and schools and charitable institutions, we want no favored class, and our influence should be exerted to see that all property stands equally before the law.

The routine business of official reports followed the president's address, occupying the remainder of the morning session. At the subsequent sessions committee reports were submitted, and papers were read, of which a number of the more important are published in full in this number of MUNICIPAL ENGINEERING, by special arrangement, as the meeting occurred simultaneously with the sending to press of the forms for this issue.

The program embraced the following:

Report of the Committee on Electric Street Lighting, by F. W. Cappelen, city engineer of Minneapolis.

Report on the Utilization of Sewage of Vienna—a translation by the chairman of the committee on Sewerage and Sanitation, Capt. Lansing H. Beach, engineer commissioner of Washington, D. C.

"The Sewerage of Baltimore," by Kenneth Allen, C. E., principal assistant engineer of the sewerage commission of Baltimore.

"Proposed Sewage Disposal System for Washington, D. C.," by D. E. McComb, superintendent of sewers, Washington, D. C.

Report of Committee on Taxation and Assessment, by August Herrmann, chairman, Cincinnati.

Report of the Committee on Waterworks and Water Supply, by M. L. Holman, chairman, St. Louis.

"The Construction of Surface Railroad Tracks in Paved Streets," by N. P. Lewis, [illegible]

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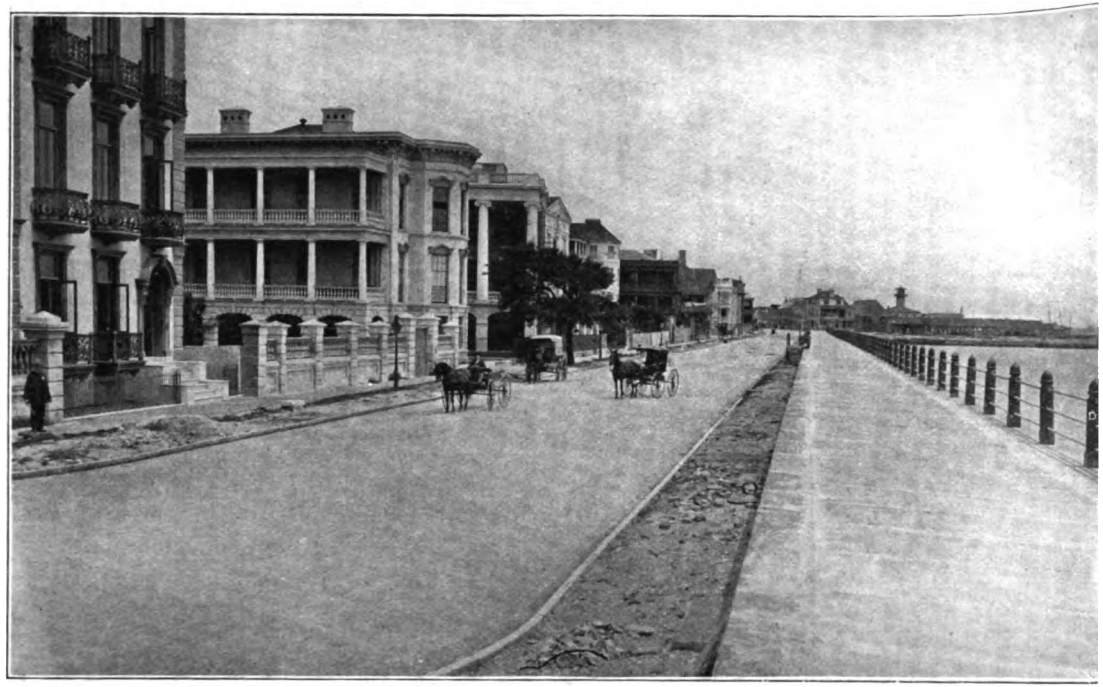

EAST BATTERY STREET, CHARLESTON, S. C., PAVED WITH ASPHALT.

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trict of Columbia," by William P. Richards, assistant engineer, Washington, D. C.

"Relative Values of Paving Material," by Geo. W. Tillson, C. E., Brooklyn, N. Y.

"Tree Planting in the Streets of Washington," by William P. Richards, Washington, D. C.

"Street Cleaning and Disposition of Garbage," by Dr. J. L. Hess, Cleveland, chairman of committee.

Report on Municipal Data, by Charles Carroll Brown, C. E., chairman of committee.

Report on Municipal Franchises, by Andrew Rosewater, city engineer, Omaha, Neb., chairman of committee.

Report on Coating of Cast Iron and Steel Riveted Pipes, by L. W. Rundlett, city engineer, St. Paul, Minn., chairman of committee.

"Electrolysis Tests at Dayton, O.," by Harold P. Brown, electrical engineer, New York, N. Y., chairman of committee on electrolysis.

"Some Data on the Subject of Electrolysis in the City of Davenport, Iowa," by E. W. Boynton, commissioner of public works, Davenport, Iowa.

Report of the committee on review, by Geo. H. Benzenberg, city engineer and president of board of public works, Milwaukee, Wis.

The local committee, on behalf of the commissioners and citizens of the District of Columbia, arranged for an excursion on the Potomac river to Mount Vernon and Marshall Hall on Friday. Arrangements were also made for the members to call in a body on President McKinley at the White House.

Committee reports and papers read during the sessions of the Society follow this outline of the proceedings.

ELECTRIC STREET LIGHTING IN AMERICAN CITIES.

Mr. F. W. Cappelen, chairman of the Committee on Electric Street Lighting, paid a compliment to the intelligent and efficient work of his predecessor, Mr. J. A. Cabot, the former chairman, and said: "As Mr. Cabot stated last year, it is a very unsatisfactory task to obtain proper information through correspondence, but as this appears to be the only method, your committee, particularly Mr. Hunter, of Allegheny, and your humble servant, entered into correspondence with all the cities, some 180, which in 1896 answered the committee's inquiries. Your committee desired particularly to find out if any changes in prices per lamp per year had taken place during the last two years. It is, therefore, a pleasure to be able to report that reductions have been made in a number of cities. (See Table No. 1.)

"It will be seen that an increase cluded in the comprehensive table published by this society in the annual report of 1896 no changes have taken place; hence, it is useless to cause a repetition of said table to be printed.

"Last year the committee on electric lighting caused the statistics gathered by the General Electric Company of Schenectady to be printed in the annual report for 1897 without comment. The averages that can be deducted from said report check very well in general with similar averages obtained from your committee's report in '96. But it will probably be rather surprising to you to learn that said General Electric Company's statistics do not, as far as can be found, contain the figures of cost, etc., pertaining to a single city owning and operating its own municipal plant. It, of course, may be that the General Electric Company

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TABLE NO. 1.

2,000 CANDLE POWER LAMPS.

CITY.	SCHEDULE.	Price in 1896	Price in 1898	Contract period before.	Contract period at present.
Boulder, Colo.	All night	$108.00	$ 96.00	2	5
Greely, Colo.	To midnight	150.00	93.00	5	1
Galesburg, Ills.	Moonlight	135.00	75 00	.....	1
Joliet, Ills.	All night	100.00	90.00	.....	5
Frankford, Ky	All night.	68 00	80.00	5	3
Keokuk, Iowa	Moon	68.00	75.00	10	5
Saginaw, Mich	All night	105.00	95.00	5	3
Minneapolis, Minn	All night	150.00	118.00	1	1
Minneapolis, Minn	Moon	125.00	100.00	1	1
Red Wing, Minn	Moon	144.00	90.00	0	3
St. Cloud, Minn	All night	120.00	80.00	.....	1
Marshall, Mo.	Moon	80.00	60.00	3	1
Fall River, Mass.	All night	159.85	131.40	4	5
Worcester, Mass.	All night	127.75	116.80	3	3
Omaha, Neb	All night	120.00	114.50	2	6
Glen Falls, N. Y.	All night	109.50	91.25	3	5
Utica, N. Y	All night	127.75	124.00	2	5
Lorain, O.	Moon.	60.00	65.00	0	5
Philadelphia, Pa	All night	128 00	119.01	.....	1
Dalas, Texas	Moon	90.00	75.00	3	1
Montpelier, Vt		78.00	43.00	1	3

1,200 CANDLE POWER LAMPS.

New Haven, Con	All night	109.00	98.55	3	3
Pittsfield, Mass	All Night	100.00	95.00	.....	Moon.
	Moon	65.00	62.00		
Cambridge, Mass	All night	115.00	100.00	1	1
Summerville, Mass.	All night	120.00	110.00	5	0
Butte, Mont.	Moon	168.00	144.00	0	3
Hudson, N. Y	All night	114.00	198.00	4	5
N. Tonawanda N. Y.	All night.	78.00	84.61	5	1
Brooklyn, N. Y.	All night	127.75	124.10	1	1
Watertown, Wis.	Moon	66.00	55.00	2	3

TABLE No. 2.

PLANT	No. Lamps	Candle Power	Schedule	Cost per year	Cost of plant	Cost of Plant per lmp
Prescott, Arizona	209	2000	Moonlight	$ 41.27	$ 35.000	$169
South Norwalk, Conn.	100	2000	Moonlight	60.22	14,000	140
†Jacksonville, Fla.	375	2000	All Night	90.00	140,000	373
Bloomington, Ill.	300	2000	Moonlight	60.00	83,000	277
Chicago, Ill	....	2000	All Night	100.00	.....	....
Champaign, Ill.	72	2000	Moonlight	64.30	.....	....
La Belle, Ill.	98	2000	Moonlight	46.00	12,400	126
Ottawa, Ill.	133	2000	All Night	57 50	.....	....
Kendalville, Ind	60	2000	All Night	36.00	8,000	133
Topeka, Kans.	184	2000	Moonlight	56.21	47,000	255
Emporia, Kans	57	2000	All Night	108.00	.....	....
Bangor, Me.	152	2000	All Night	45.00	40,000	263
Reading, Mass.	158	1200	All Night	65.00	35,000	221
Bay City, Mich.	181	2000	All Night	49.00	32,674	180
Detroit, Mich	1744	2000	All Night	83.50	750,000	....
Savannah, Mo.	26	1200	Special	37.78	12,000	461
St. Joseph, Mo.	369	2000	Moonlight	57.00	92,000	249
Dunkirk, N. Y.	75	2000	Moonlight	45.50	21,000	280
Fredonia, N. Y.	58	2000	Moonlight	42.00	.....	....
Hamilton, O.	216	2000	All Night	75 00	100,000	463
Columbus, O.	390	2000	All Night	74.50	.....	....
Marietta, O.	112	2000	Moonlight	39.00	18,000	160
Martin's Ferry, O.	100	2000	Moonlight	.....	21,000	210
Tacoma, Wash	....	....	.....	100.00	.....	....
§Fort Worth, Tex.	68	2000	Moonlight	64.48	44,000	647

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prices are very low, but says it is very difficult to get the right information as to what is included in the price per lamp. Particular attention is called to Detroit and editorial discussions of its recent report. It was suggested that the convention particularly discuss the questions of interest, depreciation and taxation in connection with municipal ownership of lighting plants. These features, it was stated, had probably received more thorough consideration than had been given before at any other point in the country in the last contract for electric lighting between the city of Boston and the Boston Electric Light Co. In Boston it was decided that 7 per cent. on the entire investment exclusive of land should be allowed for depreciation. Mr. Cappelen, in his estimate of cost for a municipal plant in Minneapolis, had considered 6 per cent. a fair allowance for depreciation, but did not consider insurance, which, he thought, should be done.

Mr. Cappelen, in concluding his report, said that he thought much credit was due the American Society of Municipal Improvements for the reduction in the cost of electric street lighting throughout the country.

THE PROPER CURBING OF STREETS.

By Horace Andrews, M. Am. Soc. C. E., City Engineer of Albany, N. Y.

The methods of improving city streets have attained such a degree of development that further progress towards perfection must be necessarily slow and can best be assured by a careful examination of each item entering into street construction.

We can realize the present excellence of modern streets by looking backward to the times, not so very remote, when the condition of the streets in London was far worse than anything we would now tolerate. At the close of the reign of Charles the Second, about 1685, when London was a city of about 500,000 inhabitants, its streets were in a state thus graphically described by a distinguished historian: "The pavement was detestable. * * The drainage was so bad that in rainy weather the gutters soon became torrents. * * This flood was profusely thrown to right and left by coaches and carts. To keep as far from the carriage road as possible was, therefore, the wish of every pedestrian. The mild and timid gave the wall; the bold and athletic took it."

The conditions depicted are sufficiently appalling, and we might anticipate that the rapid advance of civilization would soon lead to radical reform. However, at a date eighty years later, so little progress had been made that we find the state of London streets described as follows: "Foot passengers are protected by rows of posts at intervals four or five feet. Flat paving stones are not in general use and those that have been laid down are small and insecure. * * The only pavement, both for the road and the footway, consisted of large round pebbles, over which the rolling of the vehicles made the most dreadful noise. In the year 1762 however, an improvement was introduced in Westminster, followed by

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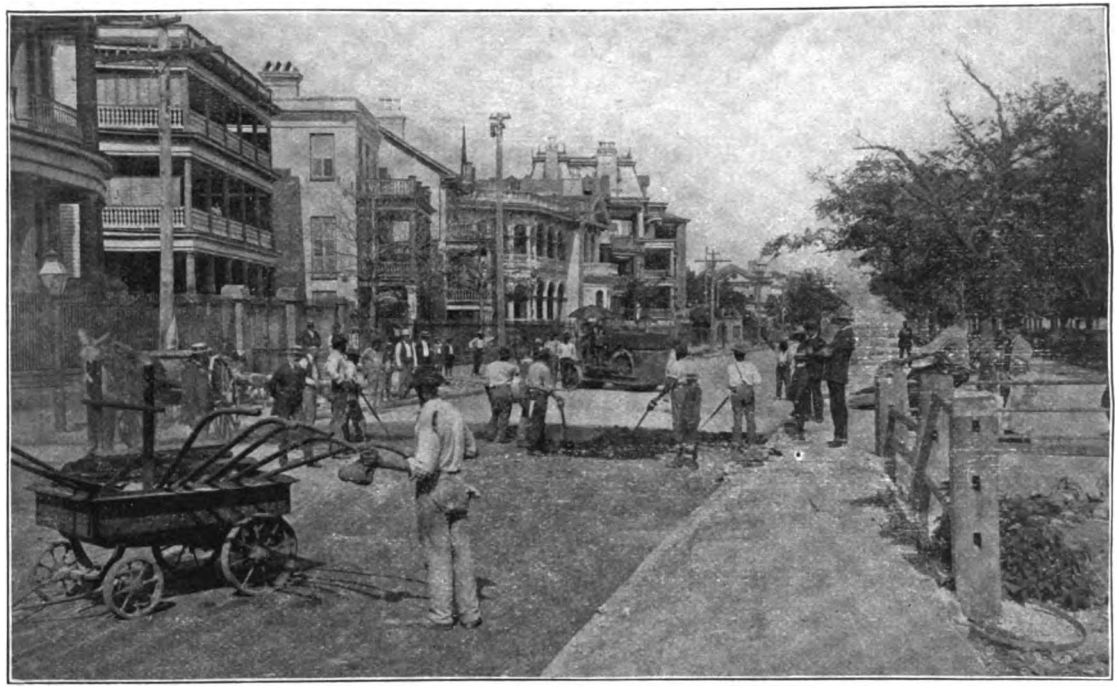

LAYING AN ASPHALT PAVEMENT ON SOUTH BATTERY STREET IN CHARLESTON, S. C.

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the city of London in 1766. The roads were paved with squares of Scotch granite laid in gravel; the posts were removed; a curb was laid down; gutters provided and the footway paved with flat stones."

Here we see the beginnings of our present raised sidewalks and can realize the painful inconvenience, endured for so many years, on account of their absence.

To retain the sidewalk at its proper elevation and to help form the gutter, the curbstone was used. It is the purpose of the writer to call attention to this detail of street construction to which, frequently, little thought seems to be devoted.

The functions of a curbstone are such that great stability should be insured, yet we often perceive that both permanence and strength are disregarded. Frequently specifications for pavement of the roadway call for excellent and expensive work, while the curbstone is either left to be furnished without extra cost, as an incidental, or a stone of most insufficient size is specified. A recent specification for sheet asphalt pavement in the streets of one of our large cities calls for a curbstone three inches thick, in lengths of four feet or over, and of such depth as to extend four inches below the surface of the pavement at the gutter, no special foundation being mentioned.

Let us consider the disturbing forces that tend to displace the curb and destroy its alignment. The pressure of the earth behind the due to the freezing of the ground beneath the sidewalk. The pressure from the expansion of freezing earth behind the curb is most apt to occur where the sidewalk is partly sodded and the ground is accordingly moist. Successive freezings of the earth behind the curb will occasion a succession of thrusts forward till the curbstone, when of faulty design, is sometimes inclined 60° or more from the vertical.

The ground below the curb is also upheaved by frost at places where the subsoil can become saturated through percolations from the sidewalks or permeable pavements on the roadway. The displacement from beneath tends to alter the height of the curb and to impair its appearance seriously. It is of importance that the height of the curb should be permanently maintained, as it serves for the regulation of the cross-section of the roadway and sidewalks and for fixing the elevations of the houses. Where the sidewalks are sodded, and especially where the curb is of small cross-section and improperly supported, tile drainage may be of benefit. The writer has found it possible to secure stability without such drainage, even with sodded walks. Drainage may sometimes be a desirable safeguard, but great care should be exercised lest the soil should be so loosened in constructing the drain as to cause the curb to drop out of alignment. Posts and trees set too near the curbs tend to break and destroy the

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A VIEW OF DOUGLASS STREET, PAVED WITH ASPHALT, IN THE EXPOSITION CITY, OMAHA.

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at certain places in the streets of London, and a concrete curb with a rounded edge of steel has been patented and used to some extent in this country.

The municipal engineer must seek a means of guarding against the destructive action of the various agents referred to, and at the same time he should endeavor to avoid an expenditure so great as to be oppressive. Where stone can be readily procured, the writer believes this to be the best material for the visible portion of the curbstone, and that the best kind of stone is granite of good quality. To render such curbing economical it should have a cross-section of moderate size; to insure its stability, it should be reinforced with concrete. For æsthetic considerations, the stone should be sufficiently well dressed to present a neat and uniform face and top surface. Granite has the advantage over most stone of looking well, even if somewhat roughly faced.

The comparative cheapness of concrete should lead to its liberal use, and in case stone is difficult to procure the entire curb may be formed of concrete. Such curb will never convey as good an impression as when formed of natural stone, nor will it resist the wear of vehicles as well. Concrete curbing must be made with extreme care and with the best materials; but concrete used merely for adding to the stability of a stone curb need not be of better quality than that employed for the pavement foundation.

The curbstone should have a thickness at least equal to the depth of the gutter in order not only to be stable but to appear so. In many cities abroad curbstone of as great a thickness as twelve inches is employed, and in Washington curbstones eight inches thick and eight inches deep are used. The occasional use of gutters of a depth of eight inches or greater, especially at receiving basins, might render a depth as small as eight inches insufficient. The writer is opposed to the use of a gutter stone. It is generally an unnecessary expense and the longitudinal joint between it and the pavement is much to be condemned. In narrow and heavily traveled streets every longitudinal joint having a length as great as one or two feet is sure to become a rut under the wheel traffic.

A concrete curb, with gutter formed in one piece, is admirably adapted to secure stability, but is open to objection for the reasons stated. The end joints of curbstones should be so cut as to look well from the top and front. They should be substantially square, but need not be cut precisely so for the entire thickness of the stone. In Liège, in Belgium, the curbstones, seven and one-half inches in width, are tongued and grooved at the ends, and a similar construction is seen in front of the Public Library in Boston. It is needless to say that such construction is merely an oddity, and is an unnecessary expense. The Liège curbstone is an interesting example of the development of one detail of street construction, with the neglect of others of greater importance; for in that city, the sidewalks, like the roadway, are paved with cubes of stone, four and a half inches on a side, concerning which a writer pathetically remarks: "One could wish himself shod in iron to escape the discomfort and pain caused by the inequality of these torturing cubes."

In setting the curbs it is well to keep the ends from actual contact. For this purpose strips of hoop-iron can be temporarily inserted be-

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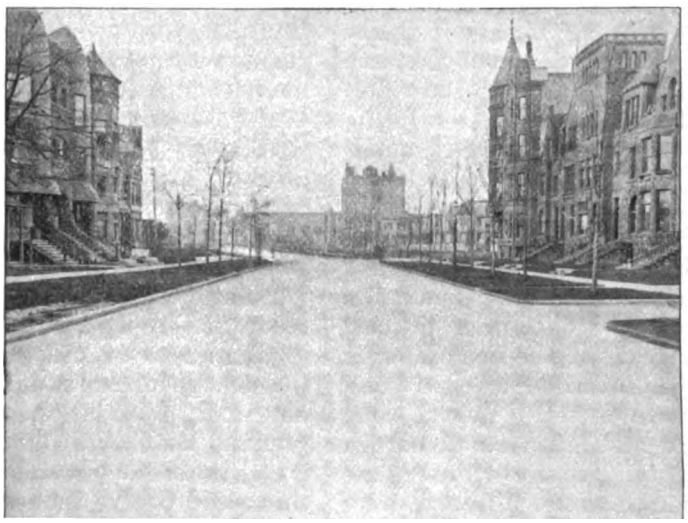
THE CHANGE WROUGHT BY GOOD PAVEMENTS.

ELLIS AVENUE, CHICAGO, WHEN PAVED WITH MACADAM.



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tween the ends of the curbs as they are set.

Specimen curbs should be placed on exhibition and referred to in the specifications. The pattern curbs should be dressed in every respect in accordance with what the engineer desires, and with due regard for what is practically attainable without excessive cost.

The foundation of the curb should be of concrete, having a depth of six inches. The depth of the curb should be such that the concrete under it will be nearly continuous with that under the street pavement.

The concrete placed behind the curb should have a thickness of six inches, and should be brought to a level surface, about three or four inches below the surface of the sidewalk. The layer of concrete under the pavement will then pass beneath and up behind the curbstone, affording an excellent support at a moderate cost; a cubic yard of concrete making foundation and backing for about thirty feet of curb. Concrete should have a slight excess of mortar, and should be composed of hydraulic cement, sand and stone in small pieces. It will then be possible to consolidate it without disturbing the alignment of the curb. A mold should always be formed for the concrete. For that beneath the curb a piece of 6x6 inch timber, placed in front of the bed, answers very well, and can be removed when the concrete is set. Boards, one than three and one-half feet. Contractors usually furnish stones considerably longer than this, as the labor of dressing joints is thereby reduced.

The appearance of street corners is much helped and vehicle traffic is facilitated by the use of circular curb of large radius. The writer for several years used a radius of 5.73 feet, which gave a length of curb of a tenth of a foot for each degree of center angle. This radius has more recently been increased to eight feet.

The numerous driveways crossing the sidewalks should have small circular corners. For these a radius of about two feet is a convenient one. Where streets are not laid out on a rectangular system the angles which the curb lines make with one another should be carefully measured in advance and in all cases the circular curb should be cut to the proper length to join the tangents neatly.

In the city of Albany, N. Y., an effort has been made for several years to improve the quality and to increase the stability of the curb. The resulting appearance of the streets has been a source of satisfaction to the property-holders as well as to the city engineer.

About forty-seven miles of curbstone have been laid with concrete foundation. None of this curb exceeds fifteen inches in depth, yet its alignment is much better than that of the former twenty-inch curb on sand foundation. The first

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About 5½ miles of the five-inch granite curb have been laid while thirty miles of the 6x12-inch granite curb are now in place.

The granite curb as quarried costs about 22 cents per lineal foot delivered in Albany, coming by rail from Vermont and New Hampshire. Contractors have often laid it at prices too small to afford any profit, making up their loss on other items. Thus in 1897, 9.16 miles of 6x12-inch granite curb were laid at an average price of 39 cents per lineal foot for straight curb, and 47.7 cents for circular. This year 7.62 miles of the standard curb have been laid at an average price of 52.5 cents per foot for straight, and 76.4 cents for circular. The above prices include concrete and all incidental work.

Under the laws of the state of New York, all curbstones used by a municipality must be dressed within the limits of the state. Practically this requires all granite curb to be dressed within the city. The result in Albany has been a favorable one. The employment of citizens has met with popular approval. The opportunity of purchasing curb in its rough state is not confined to one or two quarries, whereas the number of quarries turning out dressed curb is very limited. The cost of the curb to the contractor has therefore been materially lessened since the passage of the law referred to.

In conclusion the writer would urge that substantial and handsome curbstone be used on all well-paved streets. Without such curbing the best pavement looks somewhat inferior and may be compared to a poorly-framed painting. Civic pride can only be aroused and municipal improvement can best be insured by special attention to those details that appeal most directly to the eye, and a proper curbstone is not an insignificant detail.

Appended to this paper are the usual specifications for curbstone at Albany, N. Y.

SPECIFICATIONS FOR CURBSTONES.

(1) *New Curbstones.*—All the new curb furnished and set shall be of the best quality of granite curb. All curbstones must be equal in quality to and have their faces dressed as well as the specimen granite curbstones, marked B. C., in the office of the city engineer, the front of the curb, when not self-faced and out of wind, to be pointed to a smooth face, the top to be axed to a plane surface. The stones to be in lengths of not less than three (3) feet six (6) inches, and to be six (6) inches in thickness, and of a depth of not less than twelve (12) inches; and if they exceed this depth by more than two (2) inches, extra excavation will be required, so that at least four (4) inches in depth of concrete shall be below the curb in every place. The face and upper edge are to be dressed to a line, and the top cut to a uniform bevel of one-quarter (¼) inch with the front. The front of the curb is to be smooth and to a fair line, without rounding and with no projection or depression exceeding one-quarter (¼) of an inch from the working line, and to be so dressed on the face from the top to the depth of nine (9) inches. The bottom to be roughed off, parallel to the top, to the full thickness of the stone. The ends from top to nine (9) inches below top line shall be truly squared and dressed, so that when laid and abutted, the one against the other, joints shall not exceed one-eighth (⅛) of an inch in width, for the depth of nine (9) inches from the top. Strips of hoop iron shall be placed between the ends of the curb to keep them slightly apart. These strips are to be removed after the curbs are set. The curb shall be set truly to the line and grades given by the city engineer. *At least two inches in thickness* of the curbstone, measuring from the front surface, shall be squarely dressed at the ends. The back of the curbstones must be dressed smooth, and even to a depth of two (2) inches below the top of the same.

(2) *Circular Curb.*—The corners of streets, driveways and alleys shall be provided with granite circular curb *cut with a radius* to be given by the city engineer. The curb must be furnished in the number of pieces to each corner that may be specified by the city engineer, such curb to be of the same width and thickness as the curb in the other portions of the street, and to be dressed and set in like manner. The joints must be cut truly radial. The entire length of circular curb at each corner, measured on the outer surface of the

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curb, shall be exactly as the city engineer may direct.

(3) *Concrete Foundation for Curbstones.*—Concrete to be used as a foundation for the curbs shall be composed as follows, and mixed in the manner and with the proportions stated below: The contractor must provide a water-tight box or platform of sufficient size, and on this all concrete must be mixed. The contractor must provide two measuring boxes, one for the sand and one for the broken stone, these boxes to be of the dimensions given by the city engineer, and to be gauged and approved by him: the sand and broken stone for all concrete used shall be measured in these boxes, or in such other way as may be approved by the city engineer. In making the concrete, a mortar is first to be made, of one (1) barrel of freshly-burned Rosendale cement of the best quality, and equal to that used for the foundation for the pavement, eighty (80) pounds weight of such cement being taken as equal to one (1) cubic foot in volume, and one (1) box containing one and one-half (1½) barrels of clean, sharp sand; these ingredients shall be thoroughly mixed dry, and a moderate amount of water (about sixteen (16) gallons) shall afterwards be added to produce a paste of proper consistence. To the mortar, as above specified, shall be added one box, containing three (3) barrels of clean broken stone, *screened so as not to exceed one and one-half* (1½) *inches in greatest dimension* which shall be thoroughly freed from dirt and dust and be thoroughly wet before being added to the mortar. The whole mass shall be thoroughly turned over and mixed until every particle of stone is completely covered with mortar. The concrete material shall be turned over and mixed with shovels, by skilled workmen, upon the water-tight box or platform above mentioned, not less than four times before it is used. A piece of six-by-four or six-by-six-inch scantling shall be placed in front of the bed prepared for the concrete, which must be rapidly spread and *thoroughly rammed in place with a heavy rammer till free mortar appears on the surface.* After the ramming the scantling is to be removed. All mortar or concrete left in the boxes or platforms at the noon hour, or at night, or whenever concrete laying shall have been stopped for one hour, must be immediately thrown out and must not be used as a foundation for the curbstone.

each side of each receiving basin top the concrete is to extend back of the curbstone to a width of one (1) foot and to extend one (1) foot in depth below the bottom of the curbstone for the width of eighteen (18) inches. The concrete must be carefully filled into any open spaces in the end joints at the back of the curb. If necessary the joints must also be pointed in front with cement mortar. After the curb shall have been laid as herein specified and after the concrete backing shall have been tamped in place, Portland cement grout mixed as specified for grouting brick pavement shall be poured over the concrete backing until all the interstices and all open spaces at the ends of the curbstones, are thoroughly filled therewith. No sand or earth shall be placed on the concrete backing until it is grouted as herein specified.

(4) *Protection Curb.*—Where the new pavement adjoins a private driveway crossing the sidewalk, a line of protection curb will be set on edge along the curb line with its top surface one (1) inch above the bottom of the gutter. The protection curb will be formed of sound pieces of the present curb or other equally good measuring not less than three (3) inches thick, and fifteen (15) inches wide, to be furnished and set by the contractor, without extra charge therefor. The protection curb may be omitted where the driveways are to be paved with brick or stone blocks and where the adjoining granite or brick street pavement at intersecting streets is in good condition and to the satisfaction of the inspector. Similar protection curb must be furnished and set at all junctions between the contractor's brick pavement and cobble-stone pavement, or at unpaved streets or alleys; the top of such protection curb to be flush with the surface of the brick pavement.

(5) *Old Curb to be Reset.*—The old curb now on the street is to be reset behind the new curb and at a distance from it sufficient to allow the six (6) inches of concrete to be packed in between the curbs. The top of the old curb, as reset, or of boards used in place thereof, is to be two (2) inches below the top of the new curb. The contractor is not to remove any of the old curb from the street. No price will be paid for resetting curb as here provided. Where there is no old curb or the old curb has been removed by the owners, a mold for the concrete must be formed of boards which must be left in place permanently. For all such boards left permanently in place the sum

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tion, concrete or sand, must be used for the curb relaid, and in the same quantity, as that on which it was originally placed. Curbstones reset on curb lines with new concrete or sand foundation will be paid for in accordance with the contractor's bids for relaying curb. Curbstones reset, behind the new curb to form a mold, as heretofore provided, *will not* be paid for, the price for such resetting of curb being included in the contractor's bid for new curb.

TREE PLANTING IN THE STREETS OF WASHINGTON.

By William P. Richards, Surveyor of the District of Columbia.

The selection, planting and care of all trees in the streets of Washington is under the direction of the District authorities. Individual preferences or private enterprises are not allowed to regulate this improvement as is generally done in other cities. Moreover, the city has its own nursery where seeds planted from its own trees grow and supply all the needed varieties.

In 1871, during the era of great municipal improvements, Governor A. R. Shepherd appointed a commission to regulate this important matter, and their efforts have brought about the beauty and uniformity of shade existing in Washington to-day. This commission acted in an advisory capacity and served without pay, the first one appointed being unchanged for twenty-five years. Its members were Mr. Wm. R. Smith, Superintendent of the Botanical Gardens, Mr. Wm. Saunders, Superintendent of Agricultural Grounds, and Mr. John Saul, a local nurseryman. During the last thirteen years Mr. Trueman Lanham has acted as chief executive officer of the commission, or superintendent of parking.

Under the guidance of these men tree planting has never been at an experimental stage, but an undertaking so great has, of course, had its lessons of experience. The qualities of a good curbstone tree were set forth in the annual report of the commission in 1872, as follows:

First. A somewhat compact stateliness and symmetry of growth, as distinguished from a low spreading or pendant form, so that the stem may reach a sufficient height to allow the free circulation of air below the branches.

Second. An ample supply of expansive foliage, of bright early spring verdure, and rich in the variety of colors and tints assumed during autumn.

Third. Healthiness, so far as being exempt from constitutional diseases, as well as by maladies frequently engendered by peculiarities of soil and atmosphere impurities.

Fourth. Cleanliness, characterized by a persistency of foliage during the summer, freedom from fading flowers, and exemption from the attacks of noxious insects.

Fifth. It should be easily transplanted, of moderately vigorous growth, and not inclined to throw up shoots from the roots or lower portions of the stem. A tree of extremely rapid growth is generally short-lived.

Sixth. The branches should be elastic rather than brittle that they may withstand heavy storms; and lastly there should be no offensive odors from foliage or flowers.

Of course, no tree planted amid the artificial conditions found in a city will fill such rigid requirements. This report of 1872 recommended as best the silver maple (*acer dasycarpum*), the American linden (*tilia Americana*), and European sycamore maple (*acer pseudo-platanus*). The American elm (*ulmus Americana*) was thought to fill all the requirements when not subjected to the attacks of insects. The tulip tree (*liviodendron tulipifera*), sugar maple (*acer saccharium*),

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sweet gum (*liquidamber straciflua*), and the red maple (*acer rubrum*), were named as the most beautiful of trees, their only drawback being that of not growing freely after transplanting. The Norway maple (*acer platanoides*), the negundo (*acer negundo*), and the American ash (*fraxinus Americana*), were recommended for certain places. For wide avenues the buttonwoods (*platanus occidentalis* and *platanus orientalis*) were considered rapid-growing and effective trees.

Of late years some varieties have been planted that are not mentioned in the above, and others, once common, have been pronounced as poor street trees.

Washington was a city of young trees during the seventies, and in the spring of 1873 more than six thousand trees were planted, consisting of silver maples, Norway maples, American elms, American and European lindens, sugar maples, tulip trees, American white ash, scarlet maples, various poplars and ash-leaved maples.

From 1880 to 1888 the caterpillars were extremely numerous in the city and opportunity was had for observing which trees were mostly a prey to them. It was found that the white poplar and the negundo or ash-leaved maple were the first to be attacked and next the lindens, elms and sycamores (or western planes) and white ash. Those mostly exempt were the Carolina poplars, the sugar, silver and Norway maples, the tulip tree and honey locusts.

A careful count was made of the trees in 1887, and by comparing this with the number since planted and those removed there is found to be more than 78,000 trees, which if placed thirty feet apart would line both sides of a boulevard between Washington and New York. These consist of more than thirty varieties, but seven-eighths of the number may be placed in less than twelve varieties. The number, location and peculiarities of the principal trees may best be described separately.

The silver maple (*acer dasycarpum*) numbers about 25,000, or nearly four times any other variety. It is almost a perfect street tree, as it stands transplanting well, is a quite rapid grower and has beautiful foliage, which is never too heavy to allow free circulation of air. It loves moisture, but nevertheless stands seasons of drought better than many others. It can not attain at the curbstone the magnificent proportions that it has in the park or field and must be trimmed at times very severely. It is seldom attacked by the caterpillar, but some years ago a scale appeared on the trees that caused serious thoughts of their removal. This has since disappeared and the trees are in a healthy condition. It taught the lesson, however, that it is well not to have most trees of one variety. The most recent plantings of the silver maple may be seen on S street and good examples of severe trimming on Third street, N. W., and on T street, N. W., from Third to Fifth streets.

The Norway maple (*acer platanoides*) numbers about 5,000 trees and it is unfortunate that more of them were not planted in past years. They require considerable care in transplanting and are a little too thick in foliage. They are handsome in leaves and form and are of strong fiber, so that they withstand storms well. Insects seldom trouble them. Two splendid rows of them may be seen on Eighth street, N. W., above G street; on

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Sixteenth street, N. W., above H street and on Thirteenth street, N. W., above K street.

The American elm (*ulmus Americana*) numbers about 5,000 trees planted on various avenues. It is a tree of spreading form so that, on roadways fifty feet wide, its limbs arch the entire space. From this it is liable to be split by storms. It presents a magnificent appearance at certain times of the year, but the elm-leaf beetle has preyed so constantly on this tree that it is either doomed to disappear as a street tree or else be limited to a small number. New Jersey, New York, New Hampshire and Rhode Island avenues are planted with this tree.

The buttonwood, sycamore or plane tree (*plantanus orientalis and occidentalis*) number 5,000 trees. It is a tree of large growth and must be closely trimmed as a street tree. The western plane is not an altogether handsome tree, its shedding of bark giving its trunk an ugly appearance, which is objected to by many. As a shade-producer it has no fault. The eastern plane is its superior in many respects, and it seems unfortunate that its merits were not recognized sooner. Its size and nature make it better fitted for avenues than the narrower streets. Its foliage is splendid in appearance and of proper thickness. It is free of insects. If the elms were replaced, in part at least, by this tree much would be added in way of ornament to the city. Good examples of the western planes may be found on Eleventh street, N. W., Tenth street, N. E. The eastern plane is best seen on Indiana avenue and at the Peace Monument. A magnificent specimen stands in the center of Lincoln Square, on East Capitol street.

The American linden (*tilia Americana*) numbers 5,000. Most of them are on Massachusetts avenue, which has four rows, nearly four miles in length. In early summer they are at their best, when their flowers fill the street with their fragrance. They need ample space and are apt to suffer much from the drought. They seem to have been planted too close in this city and have grown very little in late years.

The tulip tree (*liriodendron tulipifera*) numbers nearly 2,000. It can hardly be considered a good curbstone tree, as it requires good conditions for its development. It is fine in appearance and does well on wide parkings, as on Sixteenth street, which it occupies jointly with Norway maples, the latter along the curb.

The Carolina poplar (*populus monilifera*) numbers about 6,000 and was probably planted on account of its rapid growth. It is a good curbstone tree in many respects, is assertive, free of insects and is of good foliage. Its bad qualities are, brittle limbs, which are always broken by storms, and a persistency of root-growth that is fatal to sidewalks. Money considerations have doomed them and they are being replaced with more desirable trees.

The aspen poplar (*populos alba*) and ash-leaved maple (*acer negundo*), numbering about 2,000, although of good foliage, have been condemned as street trees on account of their liability to attacks of insects.

The ginkgo or maiden-hair tree, although few in number here, has been found to be a good curbstone tree. The pin oak, planted in the parking on East Pennsylvania avenue, has shown itself an ideal tree for an avenue or widely-parked street.

The catalpa, along the same avenue, will be removed in the near

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future. Horse chestnut trees have been grown with some little success on Thirteenth street, N. W., but can not be called a good street tree.

The sugar maple, although a queen among trees, needs too good care for an ideal street tree. No success has been had in this city with it, although it may be said that attempts have not been persistent. A fine specimen stands in the parking, northwest of Thomas Circle.

The red oak, planted on Twelfth street, where surrounded by good conditions, has been a great success.

If required to arrange a list of the trees in this city in the order of their merit and in the light of what has been here shown, I should place the silver maple, Norway maple and eastern plane side by side in the first rank. Then the ginkgo and western plane, and last those that require extra care and are well fitted for wide parkings, the American linden, the oak and sugar maple.

The planting and care of trees in Washington grows from year to year, and the future will probably demand more skill and judgment than in years past. About $20,000 is spent annually, most of it in the care of old trees. From one to three thousand young trees are planted during the spring and fall of each year. The nursery has several thousand trees of the best varieties ready for planting. After two or three years as seedlings and four or five years in the nursery rows they are taken up with no dirt to the bottom and ten inches at the top, built of strips 1x3 inches. They are held by four stakes driven into the ground on each side in a slanting direction and nailed to the box. Leather straps are nailed to the top of the box and passed around the tree to prevent any injury to the bark by rubbing in windy weather. These boxes are not an ornament to the street but are an absolute necessity for the protection of young trees. After the tree has gained sufficient strength, the box is removed and a wire netting six feet long is fastened around the tree. It costs about thirty-five cents per tree, and some forty thousand trees are protected in this way.

The proper distance to space trees depends on the locality and variety. Too close planting was done during the first year of the commission, the distance along curb being from twenty to twenty-five feet. From thirty to forty-five feet is now considered a better limit.

The trimming of trees is a bone of contention among authorities as to time, manner and extent. It is certain, however, that some city trees must be trimmed and trimmed severely if they are expected to last long.

This outline is presented as a study of the history of this enterprise, and some personal observations of late years. The experience of twenty-five years has not resulted in a unanimity of opinion in the commission itself, as evi-

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COMPILATION OF MUNICIPAL DATA IN AMERICA.

The special committee on Municipal Data, appointed on the recommendation of the president at the Nashville meeting, submitted a very full report, which was read by the chairman, Mr. Charles Carroll Brown, as follows:

To the American Society of Municipal Improvements:

GENTLEMEN: Your Committee on Municipal Data assumes that it was appointed in accordance with the recommendation of August Herrmann, in his annual address as president of the American Society of Municipal Improvements, at its meeting in Nashville, Tennessee, in October, 1897, contained in the following extract from that address:

> I would further recommend that a special committee, to be known as a committee on municipal data, be appointed, and that this committee be instructed to formulate a plan providing for the enactment by congress of the necessary legislation looking towards the more complete establishment and maintenance by the government of a national bureau on municipal data, with a view of having collected through it annually, and formulated for publication and distribution, a complete report with respect to municipal and public work of all kinds, showing the kind and quality of material used, the methods employed, the comparative cost thereof, the results obtained, the manner of using it, the conditions under which the work has been done, the manner of payments and guaranty, and such other information of importance relative thereto as the committee may deem advisable. The same to be submitted for the consideration of the society at its next annual meeting, and if it meets with the approval of the society, that such steps be taken at that time as may be necessary, with a view of having the same transmitted to congress with a recommendation that laws be enacted to put the same into effective operation.

Your committee has carefully considered the matter intrusted in its charge and fully concur in the opinion of Mr. Herrmann, expressed in a letter to its chairman, in which he says:

> I think it a very important department, and if ever established by the government will be very useful to all municipalities throughout the country, and I have no doubt but that, if your committee brings in a proper report, and the members of the Society would take a proper interest in the matter with their Congressmen of the localities which they represent, the matter can be successfully arranged.

Several methods of procedure are open, of varying degrees of importance, and the difficulties of setting in motion the machinery necessary to carry the projects to a successful issue, and the time necessary therefor, are in inverse ratio to their importance. All these modes of procedure are open to us at once, and we think that progress can be made in all at once, that in the more comprehensive plans being greatly aided by the work done in the less important lines.

1. The simplest portion of the project is most nearly under the control of the membership of the society.

An examination of the annual reports of municipal departments shows great lack of uniformity. Much of this is due to the great differences in methods of keeping accounts, and of beginning and carrying forward public works, on account of the differences in state laws, in city charters, and in local conditions. Your committee is of the opinion, however, that the variations in form and matter of reports can be reduced very greatly by agreement to follow, as closely as laws and fixed methods will permit, forms of report proposed by such a body as this and recommended by you and by competent governmental authority as models for the municipalities of the nation.

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There are in many reports evidences of lack of co-ordination of departments; of duplication of reports, under circumstances such as to render them even contradictory of each other; of separation of work among several departments which should properly belong to one; and of consequent inability to obtain any adequate idea of the economy of operation of the departments, and to prevent duplications and omissions, which produce waste and serious difficulties. Co-ordination and co-operation of departments will be facilitated by forms such as are proposed, if the city departments are required by law or ordinance to co-operate in giving full information upon the various items of the schedules, in their annual reports.

Many reports, especially among the smaller cities, are very meager in their statements regarding the operation of the departments in their technical details, while they are very full of detail as to the exact amount paid on each individual voucher allowed during the year. The forms proposed, so far as they are applicable, will bring order out of this chaos, and enable the authorities to see the extravagance or economy of their methods of construction and operation. Many other points of a similar nature might be made.

It is doubtless true that circumstances vary so greatly in different localities that comparisons of operations in different cities are not very satisfactory, and in some cases are very misleading, but the fact remains that very valuable conclusions can be drawn from general items, such as can most readily be compared in reports of different municipalities, but they are also intended, as indicated therein, for models upon which to form other more detailed schedules, covering the most minute items of construction and operation. The comparison of reports made on such schedules from year to year, is perhaps the most valuable use to be made of the scheme, an intelligent study of the reports enabling the authorities to discover the places where errors of judgment have been made, and to determine what improvements may be made in methods and the results of adopted courses of procedure. The exact forms of these detailed schedules depend so closely upon the local circumstances and the personal preferences of the supervisors of the work that they are left to the judgment of these officers, without recommendation.

The general lines of reports are so nearly alike in the nature of the case, that it is believed the forms presented, when modified by the combined wisdom of the society, can be closely followed to great advantage, individually and collectively, by practically all cities.

The committee presents forms of water-works reports prepared by the chairman, of sewerage reports prepared by Mr. Beach, and of street reports prepared by Mr. Thompson, each having had special opportunities of study in the line assigned to him. It suggests that forms for other lines of municipal work be prepared by experts in those lines, to be added to these forms if they are deemed worthy of adoption by

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addition of such others from time to time as are demanded by the extension of municipal activities.

2. One of the duties of the next session of congress will be the establishment of a bureau for the census of the year 1900. A beginning was made in the last census in the collection of municipal data, but those of us who have tried to extract anything from the data offered, have found the reports of little value for most purposes. This is due, largely, of course, to the incompleteness and lack of uniformity in the information furnished by the municipalities, but is due almost as largely to the form of report adopted and the lack of system in many of the classes of items on which information was requested.

It is therefore recommended that, when the schedules are amended, enlarged and adopted by the society, a resolution be adopted recommending the adoption of the schedules by the census bureau as the forms for reports requested by that office from the municipalities of the nation, and that a committee be appointed to present this resolution to the proper authorities at the proper time, to press it upon their attention, and to secure adoption if possible.

3. The establishment of a new bureau in any department of the government is a serious matter, requiring much thought and great labor. To what department the bureau of municipal data, proposed by Mr. Herrmann, should be assigned is the first question for consideration.

It is the opinion of this commit- mending the establishment of a permanent census bureau, with powers and facilities for collection of various kinds of statistics at any and all times as required by congress, and for the inclusion of a bureau of municipal statistics in the permanent provision for departments in such permanent census bureau; the appointment of a committee to present this resolution to congress in such manner as they may deem most effective; and an appeal to the municipalities represented in this society and at large, for aid in presenting the matter effectively to congressmen and others of influence in shaping such legislation, such appeal to be presented in such manner and at such times as the members of the committee and the executive board of the Society shall deem expedient.

The schedules for reports mentioned in this report follow as an appendix hereto.

Respectfully submitted,

CHARLES CARROLL BROWN, Ch.,
LANSING H. BEACH,
ALMON D. THOMPSON,
Com. on Municipal Data, A. S. M. I.

PROPOSED FORMS OF WATER-WORKS REPORTS.

The following schedules, proposed as forms of water-works reports, have all been taken from forms of municipal water-works reports in actual use. No one report contains all of them, but every item in every schedule is used in some such report. It is not probable that any one report would require all the schedules proposed. The attempt has been made to give forms for all the general schedules that might be required by any system of management in use. Many additional forms for reporting details are used by various water-works authorities, but no attempt has been made to cover this part of the field, the diversities in methods of

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Water-works of the city of———, ——— County, ———State. Year ending———.

Population by census of 1890. Of 18—. Estimated at date.

Ownership of works.

Dates of construction. Items.

Sources of supply, whether lake, river or stream, springs, wells, deep or surface.

Mode of supply, whether gravity from storage or distributing reservoir, pumping to storage or distributing reservoir, direct pressure, with or without standpipes.

Reservoirs. Size and capacity of each, with elevation above point stated.

Stand-pipes, size and capacity.

Settling basins, size and capacity.

Filters, kind, size and capacity.

Wells, number, kind, size, depth, level of water, pumps working and not working, greatest and least supply.

Pumping plants, size and capacity of each engine, totals for each station and for entire city. Boilers, number, size and rated capacity.

Pressure at pumps, maximum and minimum pressure in pipe or distribution system. Additional for fires.

Suction lift in feet.

Total miles of pipe.

Total number of service connections.

Total number of hydrants.

Total number of meters.

Total number of public fountains and watering troughs.

Tabular Statement of Entire Issue and Redemption of Bonds.

Heads of columns are as follows:

Number of issue.

Authority for issue.

Date of issue.

Date when payable.

Amount.

Rate of interest.

Amount redeemed.

Date of redemption.

Amount outstanding.

Right-hand column contains the numbers of the consecutive issues of bonds, with line at foot for totals.

Total Cost and Present Valuation of Works.

(This table contains all items that can properly be charged to construction, and does not contain any that belong properly to maintenance and repairs.)

Administration, including office and field outfits necessary.

Total cost of works.

The right-hand column contains in order:

The consecutive numbers of years since construction began.

The total costs of constructions.

The total amount deducted from cost at date of last report for constructions abandoned, replaced or otherwise disposed of.

The amounts so deducted during the year.

The totals of the two preceding lines.

The present valuations, being the differences between the total costs and the total deductions.

Annual Receipts.

Sales of water, regular rates.
- special rates.
- meter rates.
- meter rents.
- fire hydrants.
- street sprinkling.
- delinquent rates.
- other city purposes.
- miscellaneous.

Connections, including materials.

Permits and licenses.

Other special items as desired.

Total receipts from operation of works.

Bonds.

Interest.

Direct taxes (frontage, etc.).

City tax levy or appropriations from general funds.

Real estate, sales or rentals.

Sales of other property.

Grand total receipts for the year.

Annual Disbursements.

(Details of each of the following items should be given in separate statements with the minuteness desired.)

General items. Refunds.
- Interest.
- Bonds retired.
- Sinking fund.
- Paid to city funds.
- Stock on hand and cash balance on hand to balance statement of receipts.
- Total of general items.

Construction, Supply system.
- Reservoirs and stand-pipes,
- Intakes and wells.
- Filters.

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Maintenance and repairs.
Reservoirs and stand-pipe.
Intakes and wells.
Filters.
Buildings and grounds.
Engines and boilers.
Shops and other buildings.
Supply mains.
Street mains.
Other items, as desired.
Total maintenance and repairs.
Operation. Pumping expense.
Salaries and labor.
Fuel, including delivery.
Supplies (Oil, waste, etc.).
Total pumping expense,
Service connections.
Meter service.
Hydrant service.
Transportation of men and materials.
Office salaries and labor. Administration.
Total cost of operation.
Total disbursements.

Comparative Statement of Operation.

Heads of columns are as follows:
Year.
Receipts from operation of works.
Total operation expenses.
Total maintenance and repairs.
Net earnings above total operating, maintenance and repairs.
Interest on bonds paid, stating whether from water-works receipts or from city funds.
Sinking fund payments made, giving similar statement.
Total gallons of water pumped.
Revenue per million gallons.
Total cost of operation, maintenance and repairs per million gallons.
Right-hand column gives consecutive numbers of years since works began operation.

Comparative Meter Statement.

Heads of columns are as follows:
Year.
Number of water takers.
Number of meters.
Total amount of water consumed.
Amount estimated as used for public purposes, not metered.
Total amount of water metered.
Total receipts for water.
Total receipts for metered water.
Right-hand column gives numbers of consecutive years since works began operation.

Water Pipes in Use.

Heads of columns are as follows:
Size and kind of pipe.
Length in use at beginning of year.
Length added during the year.
Length discontinued during the year.
Length in use at end of year.
Total cost.
Per cent. each size is of the total length of pipe in use.
Per cent. each size is of the total cost of pipe in use.
Number of service connections.
Length of service connections. (Each size if desired.)
Number of hydrants.
Number of valves.
Right-hand column has line for each size and kind of pipe and for total.

Cost of Pipe Laying.

Each line laid may be described as follows:
Location of line.
— ft. of — in. pipe, weight, — lbs., cost, $——.
Pipe inspection cost.
Valves, No., —, size, —, cost, $——.
Fire hydrants, No., —, description, —, cost, $——.
— ft., — in., hydrant pipe, cost, $——.
Special castings, description, —, No., —, lbs., —, cost, $——.
— lbs. lead, cost, $——.
Coal, packing and incidentals, cost.
Labor cost.
Total cost of pipe laid.
Cost of paving.
Total cost complete.
Average cost of labor per foot.
Average cost of pipe laid per foot.
Average cost of pipe laid and paving complete, per foot.

Tables of Pumping Records for the Year.

(One for each pump or each group of pumps acting together.)
Heads of columns are as follows:
Month.
Days pump was run.
Hours pump was run.
Number of revolutions.
Average number of revolutions a minute.
Pump cylinder dimensions.
Length of stroke.
Number of gallons pumped.
Total for all engines in group.
Average per twenty-four hours.
Pounds of coal consumed, including all used for pumping, banking, heating, etc.
Steam cylinder dimensions.
Average steam pressure——, maximum ——, minimum——.
Average water pressure at pump——, maximum——, minimum——.
Average suction lift——, maximum——, minimum——.
Total lift of water, including friction.
Pounds of ashes removed.
Duty per 100 pounds of coal.
Right-hand column contains a line for each month in the year, total for the year and averages.

Cost of Pumping.

(Table for each station.)
Population served, if possible.
Builder and kind of each pumping engine, and cost.

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Number and kind of boilers, size and cost.
Cost of station buildings and other appurtenances. (Divide into independent groups if more than one group in station, for the following items:)
Daily capacity of each engine.
Hours each pump was run during the year.
Days each pump was run during the year.
No. gallons pumped a day. Average, —; max., —; min., —.
Total gallons pumped in a year.
Average feet lift, including friction. (Delivery pressure and suction.)
Average feet lift, static.
Pounds of coal used during the year, including wood, reduced to coal and with no deductions for heating or other purposes about station.
Kind of coal used, size and brand.
Cost per 2,000 pounds delivered at station. (If different kinds of coal are used, separate into items for each kind, or, if this is impossible, give average cost per ton of all coal used,
Pounds of ashes removed.
Gallons pumped to stated average lift with 100 pounds of coal.
Gallons pumped 100 feet high with 100 pounds of coal.
Duty of engine per 100 pounds of coal.
Quarts of engine oil used.
Quarts of cylinder oil used.
Total cost of fuel during the year.
Total cost of labor in pumping for the year.
Total cost of oil, waste and supplies for the year.
Total cost of ordinary repairs in pumping for the year.
Total cost of pumping for the year.
Average cost of each above item for 1,000,000 gallons to given average lift.
Average cost of each above item for 1,000,000 gallons to lift of 100 feet.

Monthly Consumption of Water.

Heads of columns are as follows:
Month.
Number of gallons pumped.
Metered.
Not metered and waste.
Average daily consumption.
Average per capita on estimated population.
Number of takers, or taps.
Number of meters.
Estimated number of consumers.
Maximum day's consumption or pumping.
Minimum day's consumption or pumping.
Right-hand column gives names of months and total.

Comparative Statement of Consumption.

Heads of columns are as follows:
Year.
Population, census or estimated.
Estimated number of consumers.
Total gallons pumped per year.
Average gallons pumped per day.
Average gallons per inhabitant per day.
Average gallons per consumer per day.

THE CINCINNATI BALANCE SHEET.

Cincinnati keeps a balance sheet in about the following form, which may be of interest to some:

Balance Sheet for year 18—.

Heads of columns are as follows:
1. Names of ledger accounts.
2. Totals of each ledger account, paid out.
3. " received, or on hand.
4. Operation paid for maintenance and expenses.
5. " received for rents, sales, etc.
6. Construction. Paid.
7. Footing of previous column entered in this, to balance, represents total cost of construction.
8. Valuation of water-works. Footing of the following column, entered in this to balance, represents total value of works (net capital).
9. Value at beginning of year, and additions during year, entered in this column.
10. Balance, assets.
11. " liabilities.

(Columns 2 and 3 have the same total. The balance of columns 4 and 5 goes to column 8 or 9, usually 9. The balance of columns 6 and 7 goes to column 10. The balance of columns 8 and 9 goes to column 11. Columns 10 and 11 have the same totals.)

The items in the right-hand column may be carried to any desired degree of detail. The following are suggested after a study of those given in the Cincinnati report. Each item appears in columns 2 or 3 or both and in others as stated below.

Names of ledger accounts.
Total valuation of water-works to column 9.
Water-works bonds to 11.
Sinking fund to 10.
City treasurer to 10 or 11.
Interest account to 4.
Cash account to 10.
Water rents to 5.
Office expense to 4.
Office fixtures to 6.
Pumping stations maintenance to 4.
" construction to 6.
(Items for each station.)
Reservoirs, stand-pipes, tanks, items for each one for maintenance and construction to 4 and 6 respectively.
Street mains, extensions to 6.
" repairs to 4.
Supply mains, extensions to 6.
" repairs to 4.
Hydrant service to 4.
Tapping service to 5.
Engineering department to 4.

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Repair department to 4.
Administration to 4.

Other Suggestions.

Erie, Pa., carries a statement of the standing of the account of the water-works with the city, which shows whether the works are self-sustaining or not, and to what extent they are paying for themselves, when all allowances are made. The items of the account are as follows:

Due from water-works to city at last report.
Received from bonds issued during the year.
Received from taxes or appropriations during the year.
Interest on first item above at rates of interest of outstanding bonds, remainder at 4% for one year.
Interest on new bonds issued from date of issue to end of year.
Office rent if in city building.
Total.
Cash to city funds. (Designate.)
Water furnished city. (Items and amounts to be charged therefor.)
Total.
Balance due from water-works to city at date of this report.

Following are headings of other tables that may be desired by some from time to time:

Hydrant locations.
Valve locations.
Pipe distribution.
Comparative statement of yearly pipe laying.
Meter distribution.
Service pipes added, discontinued and totals.
Permits issued.
Buildings examined.
Rainfall records.
Fire alarms.
Rate sheet.
Present valuation of works.

PROPOSED FORMS OF STREET CONSTRUCTION REPORTS.

Pavements. General Statistics.

City of ——, State of ——.

Heads of columns are as follows:
(Items of information.)
Asphalt, Sheet.
Block.
Brick.
Wood, Cedar Block.
Pine Block.
Granite.
Sandstone.
Limestone.
Cobblestone.
Miscellaneous pavements.

The right hand column of items of information contains the following lines:

Total square yards in city.
" miles in city.
Square yards laid in 18—.
Miles laid in 18—.
Year first laid.
Maximum grade for pavement.
Guaranteed period, years.
Maximum cost per square yard in 1898.
Minimum " " " "
Average " " " "

Foot notes:

Explain fully the items included in the price per square yard as given in each case.

Explain fully the conditions of traffic to which each class of pavement has been subjected, such as heavy, medium, light, and the satisfaction each has given in wear, with reasons.

Give extremes of temperature during year.

CONSTRUCTION DATA.

I. Sheet Asphalt.
1. Kinds of asphalt laid.
a. Number of square yards of each kind of asphalt now laid.
b. Number of miles of each kind of asphalt now laid.
c. Name kinds of asphalt admitted by the specifications now in force.
1. Foundation.
a. Character — sand, gravel, concrete, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Asphalt surface.
a. Total thickness, inches.
b. Is cushion or binder coat used?
c. Thickness of same, inches.
d. Thickness of wearing surface, inches.

II. Block Asphalt.
1. Size of block.
2. Foundation.
1. Character — gravel, macadam, concrete, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Cushion.
a. Material.
b. Thickness, inches.
c. Material used for filler.

III. Brick.
1. Size principally used.
2. Single or double course used.
3. Foundation.
a. Character—gravel, macadam, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
4. Cushion.
a. Material.
b. Thickness, inches.
5. Filler.
a. Material.
b. Merits and faults of each kind used.

IV. Wood.
1. Blocks.
a. Kinds.
b. Side.
2. Foundation.

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a. Character—macadam, plank, gravel, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Cushion.
a. Material.
b. Thickness, inches.
4. Filler.
a. Material.

V. Granite.
1. Blocks.
a. Kind of granite.
b. Size of blocks.
2. Foundation.
a. Character—macadam, gravel, etc. If concrete, give proportions of the various ingredients.
b. Thickness.
3. Cushion.
a. Material.
b. Thickness, inches.
4. Filler.
a. Material.

VI. Miscellaneous Pavements.
1. Description.
2. Foundation.
a. Material. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Details of cushion and filler, if used, and other points of construction.

Prices for Material and Labor.

1. Give market prices of the following construction materials delivered on the work, or of such of them as are used in paving work.
a. Broken stone for concrete, per cubic yard.
b. Broken stone for macadam, per cubic yard.
c. Sand, per cubic yard.
d. Gravel, per cubic yard.
e. Cement, per barrel, natural.
f. Cement, per barrel, Portland, imported.
American.
g. Filler, other than sand, per square yard of pavement.
h. Curbing, per lineal foot, material.
setting.
i. Excavation and removal of material to make place for pavement, per cubic yard.
average per lineal foot of street.

2. Give prices paid for the following kinds of labor:
a. Common labor, per day.
b. Foremen, per day.
c. Man and team, per day.
d. Concrete mixers, per day.
e. Pavers, per day.
f. Length of working day, hours.

Financial Statistics.

1. Total amount expended for pavements in 18—.
2. Total amount of outstanding indebtedness for pavements.
City debt.
Property owners' debt.
3. Proportion of cost paid by city.
Property owners.
4. Explain briefly the method of assessment, by frontage or area of contiguous property, etc. Does non-contiguous property pay portion of cost? If so, what per cent.?
5. Explain briefly method of paying assessment, cash yearly installments, etc.
6. Bonds issued to anticipate installments.
Length of time they run.
Amounts in which issued.
Interest, per cent. per annum.
Are bonds a general city charge, or are they a lien on the property assessed?

Detail Table of Streets Constructed. One for Each Kind of Pavement.

Heads of columns as follows:
Location.
Authority for construction.
Contract and contractor.
Length.
Width.
Area, square yards, including wings and intersections.
Length of curb.
Other items of materials and labor.
Cost. Excavation.
Foundation.
Wearing surface.
Curb.
Other items.
Total.
Cost per square yard. Total.
Excluding excavation.
Excluding excavation and curb.

APPARATUS FOR TESTING CEMENT AND PAVING BRICK.

In connection with the railway laboratory which has been made a tables, tanks, a drying oven, apparatus for absorption tests of atmos-

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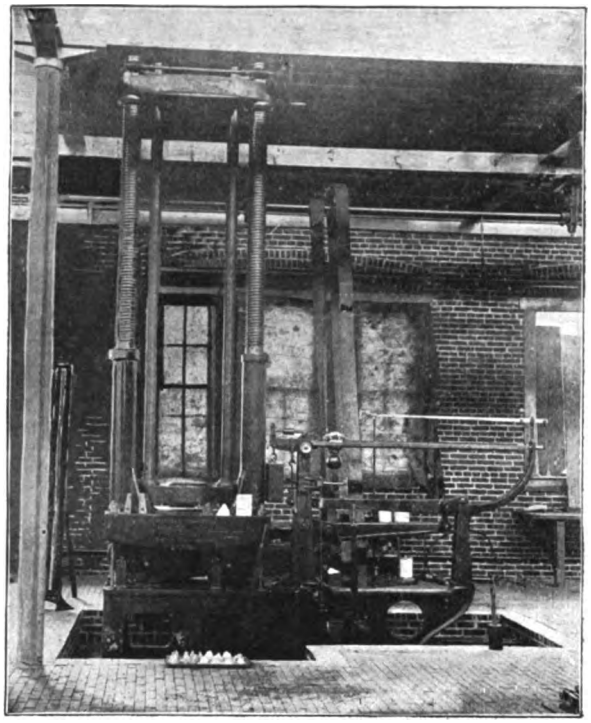
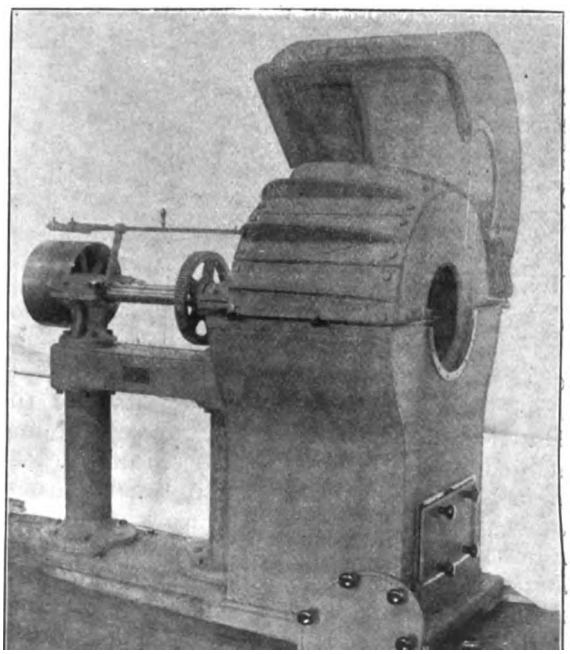


FIG. 1.—300,000 LB. TESTING MACHINE.



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pound Riehl wire tester to a 300,000-pound Riehl vertical testing machine, a view of which is shown in Fig. 1. It was on this machine that the record tests on limestone and granite were made last year for the state geologist of Wisconsin. This machine, along with two Olsen machines of 30,000 pounds and 100,000 pounds capacity, respectively, will provide for crushing and cross-breaking tests.

The equipment embraces an improved form of tumbler for the rattler test of paving brick, as shown in Figs. 2 and 3. It is of the dimensions recommended by the National Brick Manufacturers' Association, and differs from the ordinary tumbler or rattler in the fact that provision is made for the insertion of brick in the end of the barrel, thereby long by 28 in. in diameter. There are 14 slats.

The drawing of a slat is shown in Fig. 4. The length of bearing is 8 in. The diameter of the shaft is 2 7-16 in. The dust falls into a pan below, and can readily be removed. An ordinary cyclometer, such as are used on bicycles, serves to record the revolutions. A second view, given in Fig. 3, shows the gear. This improvement on the old form of tumbler originated in the laboratory, while the excellence of the details and the handsome appearance of the machine are due to the skill of W. P. Turner, instructor in the machine-room, who made the working drawings.

The work in hand for this machine includes an investigation of the effect of temperature on the re-

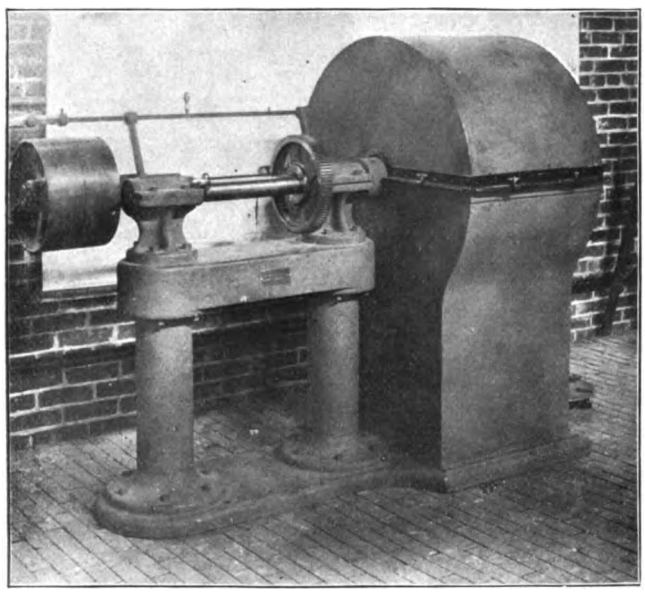

FIG. 3.—PAVING BRICK TUMBLER CLOSED.

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ical laboratory with a corps of trained analysts.

The university has wisely decided to put under one management the work in applied mechanics, and the work in tests of materials, and thus gain the benefit of the mutually helpful interaction of classroom and laboratory work. Prof. W. Kendrick Hatt, A. M., C. E., associate professor of applied mechanics, is in charge of both departments. Professor Hatt is a member of the Engineers' Club of St. Louis, of the Indiana Academy of Science, of the International Society for Testing Materials, and various other scientific societies. He is chairman of the committee appointed by the American section of the International Society to report on the present state of impact tests, this appointment coming as a well-deserved recognition of the work done by him in that field. Prof. Hatt has designed a new impact machine for longitudinal impact on iron and steel specimens.

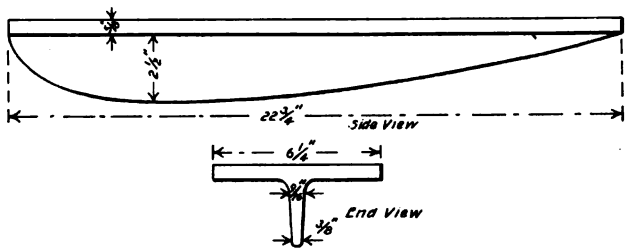

FIG. 4.

HEAVY LOADS ON PAVEMENTS.

By George L. Wilson, Assistant City Engineer, St. Paul, Minn.

In the construction of the new state capitol now in process of erection at St. Paul, the marble used for the exterior walls is quarried in Georgia and brought in large blocks to the site of the building. This is about one and one-half miles from the railroad side-track where the blocks are unloaded from railway cars to a truck having wheels three feet six inches in diameter and six-inch tires, built especially for this work.

The blocks are of different sizes, but all large enough to give very heavy wheel loads on the pavements over which they are drawn. Blocks of eleven to fourteen tons are common and there have been quite a number weighing sixteen to twenty tons. During the past season some 4,800 tons have been delivered and there remains considerably more than this amount yet to be received. The record shows that wheel loads of from three to five tons are common, an amount which is certainly sufficient to thoroughly test the pavement over which such loads pass. About two-thirds of the distance from cars to the building site is over asphalt pavement, the remainder stone and wooden block. During the early summer this traffic passed over one street, where on account of street railway tracks and a heavy vehicle traffic, amounting to seventy-nine tons per foot of roadway,

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the trucks continually passed in one line on the street. The asphalt surface being rather soft, this continued passing in one line began to squeeze the asphalt towards the gutter. The hauling of the marble was then diverted to a parallel street of less traffic, on which the trucks were not confined to the same line of travel. On this, and on two other streets, passed over for the entire time, the hauling of fifteen

1895 with Trinidad sheet asphalt by the Warren-Scharf Asphalt Paving Company and one with Bermudez. A block of one street was laid in 1897 and also a part of one street in 1898. The length of time the pavement was down did not seem to influence the results.

On one of the streets with sandstone paving the corners of the blocks have crushed off and show marks of heavy wear to which they

TWENTY TONS ON AN ASPHALT PAVEMENT ON E. FOURTH STREET, ST. PAUL, MINN.

to twenty-ton loads has produced no perceptible effect. When a load of five tons per wheel was allowed to stand for four or five minutes to rest the teams, a depression of one-sixteenth to one-eighth inch could be seen where the wheels stood.

have been exposed. Some granite paving not on a concrete foundation has been considerably rutted and parts of it will need to be relaid. The wooden block pavement has suffered somewhat, but less than was expected, owing to the

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USE OF ACETYLENE GAS FOR STREET LIGHTING.

Acetylene gas is to be used in Wabash, Ind., for street lighting. In reply to a letter of inquiry regarding the project, Mr. Robert P. Woods, city engineer of Wabash, writes MUNICIPAL ENGINEERING as follows: "Acetylene gas is to be installed in the artificial illuminating gas plant of the Logansport & Wabash Valley Gas Co. at Wabash, Ind., within a few weeks—probably before November 1. The generator is expected here about October 10, and work will proceed rapidly on the necessary changes. It is intended to supply both street lighting and domestic use. The old artificial mains will be used for the new gas. No information is known here concerning the generators as yet. It is a strange coincidence that Wabash should be the city selected for this experiment—the first instance where acetylene gas has ever been attempted for supplying a city—as it was the first city to install an electric light plant for street lighting. The Brush Electric Light Co., of Cleveland, O., constructed the tower plant here in 1881."

AGGREGATES IN CONCRETE—SAND.

By Warner H. Jenkins, C. E.

Making concrete with cement will not give satisfactory results unless there is an affinity with the mortar agent, sand. This important aggregate should be of a silicious nature, without the admixture of carbonates. Silica, in its pure state, has great affinity for cement and produces great adhesive energy, while carbonates give very unsatisfactory results.

In proportioning the compound, we should first ascertain, by authentical calculations, the quantity of sand that can be used, without detriment to strength. We have a peculiar function to perform, not merely to add to the quantity, but to suppose that we have a given measure of space to fill. We know that our sand is much coarser in texture than our cement; and knowing this we proceed to make the cement fit the sand. We accept the voids or interstices of the sand as the measure for gauging the quantity of cement. This can readily be ascertained by first drying the sand and then filling a given measure with it. We can then apply water until we have flooded the quantity contained in the space. The quantity of water used will be equal to the voids in the sand. We have now ascertained exactly the quantity of cement that will exactly fit the voids contained in the sand, but we still require an additional amount of cement over and above the filling of the voids. We wish to completely coat each particle or grain of sand with this mortar. The writer has found from experience that the quantity of cement employed with sand to produce mortar which will give satisfactory results should equal the voids plus 3 per cent. for slushing. By these proportions the voids are filled and the entire mass is completely enclosed. Sand used with

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cement in greater proportions only tend to weaken the compound. When properly proportioned, the cement mortar, when prepared, should not occupy a space perceptibly greater than the quantity of the sand alone.

LETTERS FOR THE PUBLIC.

MORE ABOUT CREOSOTED WOOD BLOCK PAVEMENTS.

To the Editor of Municipal Engineering:

Were it not for the fact that your magazine is read by a large number of people who are not engineers and have given the subject no study, but who give credence to matters they may read therein because of the fact that it is an engineering magazine, I should not waste the time to say a word about the last communication of Mr. Hetherington about creosoted wood blocks.

I labor under some difficulty in making reply to his articles as his errors in logic and statement of facts are so numerous that to answer each misstatement in detail would take up more of your space than you could give or I would care to occupy. I take it that much of this is caused from the fact that he has had no experience or training with wood pavements, and have no doubt that it would disappear if he were writing about asphalt, an industry with which he is more closely allied. The fact that a man is interested financially in an industry should not debar him from writing about it. If he is engaged in it it is a subject that he should know about, and if he is fair and truthful he is often the best writer on the subject, but, if he is interested in asphalt, this does not qualify him necessarily to write on the subject of block paving, and the public to whom his testimony goes is entitled to know his bias. Mr. Hetherington in his articles is neither fair nor accurate. To prove this one has but to read carefully his reply to my article in your September number.

He made a point that creosoting does not increase the resistance of the wood abrasion. I quoted eminent authorities to the effect that creosoting increases the *bending strength*, *compression strength* and *hardness* of lumber. He replies that he was not talking about bending strength; in other words, he quibbled.

Again he quibbled that he did not say, "*dry sand* would pack itself into an unyielding body." He did say that the various experiments to find a remedy to prevent blocks rising from expansion were "without avail;" the practice is to use *dry* sand, and it is a complete success.

He published a picture of a block street in which he claimed the blocks were raised by expansion and labeled it, "creosoted pine blocks." I called his attention to the error about the kind of wood, which he did not acknowledge, and to the fact that no provision had been attempted to take care of expansion. He made no reply to these statements, but promised that he would go to Europe some day and see about pavements. It is to be hoped that no large number of your readers will feel that all paving matters must stop until he has gone over and reported.

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But, if Mr. Hetherington quibbled in the September number, he outdid himself in his last article, in your October number. He quotes Mr. J. W. Byrnes, of Galveston, Texas, as to the method of laying creosoted blocks in that city which have lasted over twenty years and are good yet. The pavements there, as Mr. Byrnes states, are built as follows: The blocks are five inches thick, five to six inches deep and from six to ten inches long, creosoted, laid on a bed of sand that has been compacted by flooding with water, the joints filled with clean, dry sand and the surface rammed until the interstices are filled, and then flooded twice with paving pitch, thus making the pavement impervious to water.

Now, there is nothing extraordinary about the statement. It had been published once before in your magazine, but Mr Hetherington quibbles with it in this wise: "There can be no fair comparison made between the block pavements of Galveston" (some of which have been down twenty-five years and are in good condition yet) "and those of Indianapolis;" but look at his reasons: "First, because the blocks are of different dimensions from those used in Indianapolis. The foundation is entirely different and the interstices" (note the word) "between the blocks are not carefully rammed with a mixture of sand and tar." This is a misrepresentation of what Mr. Byrnes said, which was that dry sand was put in the interstices and the *surface* rammed. No mixture of sand and tar is rammed in the interstice, either here or at Galveston. It is merely another case of quibbling.

A concrete foundation is used in Indianapolis, a sand foundation in Galveston. Certainly no one with any knowledge of engineering or construction will contend that a sand foundation is equal to a concrete foundation. Mr. Hetherington's comment is, that "it is probable that the sand foundation here spoken of serves to conduct away the moisture." He does not stop to inquire or explain how moisture is to get through six inches of creosoted yellow pine with the interstices made impervious by being filled with sand and tar, but one quibble more or less does not amount to much.

As to the size of the blocks: The size used in Indianapolis is standard, and except they are not quite so wide or deep, as in Galveston, they are the same. The timber is the same, being cut from the same forests by the same firms as the pavements laid in Galveston, creosoted by the same process, laid in the same way, except on a concrete base, and yet Mr. Hetherington quibbles. Nothing is gained by such sophistry and misrepresentation. The question is asked, can good, durable pavements be made of wood; if so, they are very comfortable and desirable. The science of construction is so near standard, that no well-equipped engineer would be led away by such sophistries as that about the size of the blocks. Experience is often necessary to tell about materials, but if good, durable wood pavements have been laid in Galveston, London, Liverpool and dozens of other cities, by using hard, well-selected wood and creosoting the same, why, we know that the same can be done in Indianapolis, in Cleveland, St. Louis or any other city where the same kind of materials can be obtained.

C. A. Kenyon.

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MERITS OF THE COMBINED AND SEPARATE SYSTEMS OF SEWERAGE.

To the Editor Municipal Engineering:

In your October issue there is an article on "A Comparison of the Combined and Separate Systems of Sewerage," by C. P. Collins, C. E. The heading of his article is hardly correct, as the comparison is incomplete and the conclusion drawn therefore unfair. It might more properly be called the defects of a poorly constructed combined system. Both systems have their points of excellence, and he is correct when he says, "Engineers themselves differ widely as to the best plan to pursue." The combined system which he condemns, if properly designed and constructed as in modern practice, is almost wholly free from the defects he points out. As to which system should be adopted in the removal of sewage from any town or city, local conditions should and must decide which is best for that particular case. Many problems enter into such a work as, *e. g.*, is the sewage to be treated in its final disposal, what are the topographical conditions of the place, the amount of territory to be drained and the density of the population upon this territory. Neither system can be said to be best for all cases. That one should be chosen which seems best to meet all the problems under consideration. One can be made as sanitary as the other so far as that question is concerned. The storm water in our cities carries with it pollutions as foul and dangerous as any sewage, from which it is never free. The combined system of the past was not designed to meet the sanitary requirements of to-day, and it is not to be wondered at that it is so severely criticised.

A. B. Raymond, C. E.,
Sanitary Engineer of Detroit.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

THE BEST METHOD FOR MAKING CEMENT WALKS.

Lewis Wetmore, of Seneca, Kansas, describes his method of laying cement walks and steps, where the surface soil is "gumbo," and asks whether improvements can be suggested:

1. Foundation for steps, 18 inches, and for walk, 9 inches deep.
2. A layer of sand 4 inches deep under walk.
3. A layer of concrete, of broken stone, sand and natural cement, 4 inches thick, for walk.
4. A top layer 1.5 inches thick, composed of one part of Portland cement and one part of fine, sharp sand.

He asks if any Portland cement should be used in the base, if the top can be thinner, and if it should be finished by floating and troweling, or with a skim of clear cement.

1. The depth of the foundation depends upon the character of the soil and the ease of drainage. In an impervious soil, where there is no chance for water to get under the walk or steps, 8 or 9 inches is sufficient, but in view of the uncertainty of such conditions, sufficient depth of porous materials should be allowed to insure that any water under the walk will be drained away quickly enough to prevent heaving of the walk by freezing. Some specifications require 12 inches of such material as cinders, or broken stone, gravel and sand, so that the portions next the walk, at least, shall be entirely free from water at all times. This layer

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should be well compacted, so that there will be no settlement or displacement of material in it. A depth of 8 or 9 inches is sufficient in most cases.

2. The layer should be coarse sand or sand and gravel, with broken stone added if desired.

3. The thickness of the layer of concrete need not be greater than 3 inches. A good specification requires a box 4 inches deep to be filled even full of a mixture of one part Portland cement, same as used for top, two parts of clean sharp sand, these two being mixed thoroughly while dry, made into mortar with the least possible amount of water, and then thoroughly mixed with broken stone one inch or less in diameter, or with gravel in proportions sufficient to fill the voids in the gravel with mortar. The proportion of Portland cement is about one part to five of sand and gravel. Some contractors use natural cement in the base and seldom have complained of trouble. More cement must then be used. It is safer, if the work is guaranteed, to use Portland cement of the same brand as used in the top. When this layer is thoroughly rammed, it will be about 3 inches thick—possibly a little less.

The top layer should be put on before the concrete has set, so that a complete junction between the two will be insured. Possibly some of the trouble from using natural cement in the base comes from the fact that it sets quicker, and so a delay in putting on the top prevents this close union and results in the top separating after a few weeks. A full inch in thickness of top is sufficient unless the wear is to be very excessive. One part of cement to one of clean, sharp sand, mixed with the smallest amount of water possible is a common specification. One part of cement to 1.5 parts of sand is quite as good a mixture for almost every situation. The surface should be well troweled to a smooth surface at exactly the proper time after the layer has been thoroughly compacted and the first set has begun to show. A skim of neat cement makes a neater looking job at the beginning if it is allowed to set thoroughly before use, but it is difficult to make the surface such that it will not afterwards peel or wear off, leaving the top uneven in color and possibly in surface.

A Portland cement of known uniformity and quality and fairly slow setting should be used. Some Belgian and some other foreign cements are not true Portland cements, and have not strict uniformity in quality which is an indispensable requirement in Portland cement for walks.

Blocks should not be too large—not more than about 30 square feet in area. Many cracks in walks occur from lack of opportunity for expansion because blocks are too large or are not completely separated from each other.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.

REPAIRS TO MACADAM ROADS.

Should repairs to a macadam road be made by putting loose crushed stone directly on the old surface? Should loam or clay be mixed with the cracked stone on the road? Our road is always out of order.
W. W. S., Bloomfield Ave., Newark, N. J.

The road should be cleared of mud and dust and the old surface roughened a little before adding new material for small ruts as well as general repairs and resurfacing. Screenings from the crusher can be added, but no clay or loam in repairs. The rollers used are usually

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far too light, and hence the temptation to use loam and clay to bind the stone in place long enough to get the job done and get away, with a certainty of the need of much work within another year and a fresh job of equally poor repairs. Your case is one of many all over the country. Such repairs are neither efficient nor in the end economical. Full rules for maintaining macadam have been given in previous numbers of MUNICIPAL ENGINEERING.

USES FOR OLD STONE BLOCK PAVEMENTS.

In New Orleans we have some very old pavements which are about to be replaced by more modern ones of brick and asphalt. Can you suggest other uses for our old granite blocks, about 14 inches square and 6 inches thick, than as foundations for asphalt pavements for which they are too irregular and to elevated?

Contractor, New Orleans, La.

If the old granite pavements, as they stand, can not be used for foundations for asphalt pavements, it would be well to consider if the blocks could not be relaid at a lower grade, as at New York and elsewhere, by taking them up, grading away some of the earth and resetting the blocks. Then by the use of asphalt binder (bituminous concrete) and the asphalt pavement surface you could finish with excellent results. Another plan would be to crush the blocks on or near the street and use them for making concrete foundations for brick, asphalt or other pavement. Many could be split into blocks 6 x 7 x 14 inches, a fair size for paving unimportant streets, the new faces of the blocks being uppermost. They could be broken up into pieces about 7 inches through and used for the telford foundation to macadam or shell roads.

There are many uses for the old blocks, as they are good for foundation of walls of buildings and other structures for private, public or railway uses. The best of them could be used in connection with sewer construction, especially as bottom courses in brick sewers, as they would not scour away as much as brick from the sewage running over them.

BRICK PAVEMENTS AND THEIR EXPANSION FROM HEAT.

Where can I get official information in regard to the expansion of brick pavements from hot weather? Can it be prevented?

M. H. Moseman, Commissioner Public Works.

Write to the city engineers of Cleveland, O., Marion, O., Terre Haute, Ind., Peoria, Ill., Newark, N. J., Niagara Falls, N. Y., which are some of the places which have had interesting experiences with the expansion of brick pavements. It can be prevented by special means when the pavement is first laid, but it is hard to cure when the evil has been done. Several of the previous issues of this magazine give much information on this subject.

REDUCING WIDTH OF STREET PAVEMENT.

Is it wise to reduce the width of pavement on streets? Our streets are most of them forty feet wide between curbs.

A. M. Quimby, Paterson, N. J.

Yes, in your city and similar ones where traffic is very light. If you are to have asphalt or brick pavements the vehicles go faster and very few will be on the street at a given time. Much money is wasted in paving too great a width of the street. Have your curb or border stones moved out and reduce your street to about thirty feet. You will thus have broader sidewalks, and on residence streets more room for handsome grass plots.

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STREET CLEANING IN BUFFALO.

We are at present in a worse condition in regard to clean streets than during the past fifteen years in Chicago. Our pavements are very poor, except the asphalt and a few brick streets. These are not cleaned, except those under the park boards. How does Buffalo keep its streets so clean? and at what expense? I hold that Chicago streets must be cleaner and better, if we wish to retain many citizens who retire with their taxable wealth to other cities more attractive than ours. I have facts from your magazine from other cities, but not from Buffalo.

Alderman of the — Ward, Chicago.

Buffalo spends about $160,000 for street cleaning, $150,000 for collection of ashes and garbage, and $35,000 for reduction of garbage, making a total of $345,000 per year. The city has eight districts. The business district is cleaned by the block system, by city labor, at about $30,000 per year. A broom, shovel and push-cart complete the outfit of these uniformed men. City carts pass at intervals and carry off what the block cleaners had accumulated. The amount of surface assigned to each man to clean depends upon the amount of traffic and other conditions. The center district is flushed at night as often as best.

The rest of the city, seven districts, is cleaned by contractors at intervals from daily to weekly as ordered. Sweeping machines are in general use with some hand labor. The records are kept on the basis of the number of "great squares" cleaned once. A "great square" contains ten thousand square feet, the basis on which all bids are received. According to the kind of pavement, the prices range from 26 cents per great square of asphalt to 46 cents for one cleaning of a great square of rough stone pavement.

Snow is removed by contractors where necessary. Certified sworn pay rolls for snow removals are filed with the city and the contractor receives the amount, plus 10 per cent. to cover use of tools, superintendence, etc. Inspectors have much power, but being selected with care, with little or no political influence, the results are good. Ashes and garbage are collected by contractors daily, or less often, according to districts as ordered. The ashes collected by contract cost about 37 cents per cubic yard; the garbage about $1.90 per ton. Buffalo is a clean city, due partly to 200 miles or more of streets being paved with asphalt, and to the fact that efficient, good work, coupled with economy, is enforced without regard to politics.

Upon a basis of 300,000 inhabitants and the above details of cost, the reader can estimate what it would cost to clean his city. All he needs to know is the population of his city, the number of thousand square feet to be cleaned, the kinds and conditions of the pavements, and whether his city officials are competent and honest. He can also get the cost per inhabitant per great square or per square yard of each kind of pavement cleaned; also the cost per person for removal of ashes, garbage, etc.

SHOULD A CITY OWN AN ASPHALT PAVING PLANT?

There has been some talk here of getting our city to erect and run an asphalt paving plant. Do you know of any city which has one? Is such a plan feasible and economical? Would the pavements be well laid and kept in order?

M. A. L., St. Paul, Minn.

Experience in all municipal construction in this country and Europe has demonstrated that while it is best to have such matters as sewers, water-works, pavements, and bridges under the administration of city officials, that it is not best nor economical to have the construction of such work

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done by day labor and materials purchased by the city. In a republic where the men in charge of the legislative and executive branches of a city must be changed at various elections, and where many of these men are under obligation and closely connected with their neighbors, it is cheapest and best for themselves and the city to have public work done by contract and awarded to the lowest reliable bidder who has given proper security or a bond that he will do what the specifications require.

We know of no city owning an asphalt paving plant, nor would it be good policy or economical to erect, maintain and operate one.

Good pavements, well and cheaply laid, and properly repaired, can be obtained by having precise specifications carefully prepared, containing all requirements needed to secure a reliable pavement and to safeguard the city. Such specifications can be prepared either by having experienced engineers permanently or temporarily in the employ of the city. A city can easily compel contractors to live up to the requirements of specifications. The security for construction and maintenance can be the retention by the city of a part of the pay for the pavement or deferred periodical payments or a security bond. As to the price to be paid for pavements, that can be limited, as in some cities, to a maximum price in the ordinances and specifications above which bids will be rejected.

The solution of the paving problem is to have efficient specifications and see that they are enforced.

A municipal asphalt plant or factory would mean political influence and a constant temptation to do wrong or at least neglect the interest of the public. A city government to be successful must avoid details of machinery, patents, materials, freight, and the employment of many expert and trained laborers difficult to find and whom the city could not retain in its constant employ.

BY WAY OF COMMENT.

Cement Testing Methods. Some of the questions asked by the Committee on Cement Tests of the American Society of Civil Engineers have been answered by German experts in *Baumaterialenkunde*, indicating

ters of several different packages, says the German answer.

Why should the various samples be mixed, as a portion of this question indicates is the custom with some engineers? One requirement

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mation regarding the care the cement has had in handling and shipping which some tests from the outer portions of the package would give. The average of several samples from different parts of a package is logically more nearly correct than the average of samples from the whole shipment, for the cement contained in the one package is well mixed when combined with the sand and the strength of the mortar is measured by the average strength of the whole amount of cement in the batch. In a detailed examination of a brand of cement to determine its value, it is desirable to know the best results that can be obtained from it. In this case all possible advantages in selection of samples should be given the cement. At the same time the question of uniformity is most important and mixture of different samples should not be permitted. The effects of defective packing, neglect or carelessness in protecting and handling the packages should also be studied. In testing the cement on the work these latter questions are the important ones, and samples should be taken in such manner as to give information on them, proper comparisons being made with the best results the cement has shown in the detailed investigation of it.

Chemical analyses are considered desirable by the German when excess of magnesia is suspected, and for mixed cements, methods being left to the individual chemist. Limits of amounts allowable are not stated. Microscopical tests are at present valueless. Density and weight should be determined, but no methods are proposed which will give uniform results by different experimenters, or even by the same experimenter at different times. Tests for fineness do not differ widely from American tests, it being suggested that all the cement should pass a sieve of about 76 meshes to the inch and not more than 20 per cent. should be retained by one of about 180 meshes. Hand shaking of the sieve is most satisfactory, the same treatment being given all kinds of cement in the process. German sands are prescribed, naturally, and methods of mixing are left to the individual operator. Neither is the quantity of water required definitely fixed. Tests for constancy of volume and time of setting are like those prescribed by American specifications.

It is recommended that tensile tests be made on briquettes made 1 of cement to 3 of sand, by weight, using the German form, as the American form may not break at the smallest cross-section. The recommendation of this proportion of sand and cement is excellent. It can not be improved upon for ordinary work, but special requirements may sometimes modify the proportions.

Compression tests are said to give more reliable and more valuable results than tensile tests, being made on square briquettes about 7.75 square inches in area. This conclusion does not agree with

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present American ideas, the difficulty of securing uniform results being as yet unsurmounted.

Treatment of briquettes between making and treating agrees with American practice; also age at which briquette should be broken, the times recommended being 7 and 28 days after making. These two seem to give the most information of any two periods that might be selected, and are within the limits of time allowable for testing on all important work

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Colleges of Commerce. The first College of Commerce, the need of which was discussed in this department in September, has been established at the University of California, under the charge of Professor Carl C. Plehn as dean. The University of Pennsylvania has sustained for some years a school of finance which undertakes a small part of the work of a college of commerce. The University of Chicago announces the establishment of a similar school, and Columbia University has had one under consideration, but the University at Berkeley is the first to put the idea in full operation.

The university has long had courses in political economy, the histories of commerce and industry, transportation, banking and currency, public finance, interna- erly belong to a college of commerce, but they needed the correlation which could only be secured by placing the department under a head who would direct the steps of students, show the modifications necessary in existing courses, fill the many gaps existing, unifying the work and making it a complete whole. The dean of the new college has begun the correlating process and is now guiding the first class of students through the course. Meanwhile he is preparing for the new courses necessary and making plans for the museums, correspondents, statisticians and other aids to the collection and presentation of information.

Professor Plehn is explaining the objects and plans of the new school in a series of articles written for the *Merchants' Association Review*, of San Francisco, the first article appearing in the October number. It is apparent from this first article that he has begun the development of the school upon what may be styled the external side of the subject. Without doubt most of the graduates of the school must be satisfied with a knowledge of the details of commercial operations, technical or otherwise, becoming assistants rather than operators, but the manipulator of markets, the originator of great commercial enterprises, the adminis-

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the past it has been possible for a man of genius to dominate a very large section of the world in his particular commercial line, even though he did not have this breadth of training and wide knowledge. The days for these chances are fast passing away and the establishment of the colleges of commerce will hasten their flight. If, however, the breadth of training is neglected for the sake of the detailed knowledge, the colleges may injure, rather than aid, some of their brightest minds.

Rainfall and Stream Flow.

The state of New York has been studying the conditions of some of its watersheds with reference to the supply of water for the enlarged canals. Mr. Geo. W. Rafter has been in charge of some of these studies and, while the number of years for which data are obtainable is too small to make the results certain, he has been able, through comparison with other similar collections of greater extent, to draw some interesting conclusions.

He contrasts the proposition advanced a few years ago, that forests have little effect upon stream flow, and contends that the data are not sufficient to uphold it, while some data are somewhat contradictory. Without going into the details of his argument, the resulting conclusions may be stated—various crops require varying amounts of water, trees requiring the least.

In the investigation of one such watershed it was computed that the growing crops would require 3.4 inches more rain during the growing season in 1890 than in 1850, on account of the decrease in forest area from 40 per cent. to 9 per cent. and the changes in character of crops. It has been shown frequently that evaporation is practically constant, being almost independent of the variations in rainfall. This increase in water required for crops must therefore reduce the run-off in the streams. When it is known that the mean rainfall in and near this watershed during the growing season is from 8 to 13 inches, and sometimes falls to 5 inches, the reasons for low water in streams during the summer, and for failure of water powers formerly of value, are seen.

A balancing of conditions whereby an increase in rate of melting snow on deforested area offsets a larger amount of snow remaining to be melted in a forested area, and a dryer soil in a deforested area offsets the many retardations of the flow of water in a forested area with ordinary rains, makes the effect of removing forests upon flood heights inappreciable.

Forested areas are thus shown to be the most productive of water for a given rainfall.

Mr. Rafter's studies did not reach prairie streams. Here he would have found conditions materially different. The original condition was treeless, and there has been a slight increase in forest area. The areas being flat or

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slightly rolling, with frequent sections without adequate outlet, many swamps existed, or were formed during rainy seasons, to disappear by evaporation. These materially retarded the flow of water so that evaporation took place from large areas of water, or of wet soil. In the process of settlement and development the swamps have been ditched and the fields underdrained, free outlet being given to the water. Evaporation has thus been diminished, there being more dry soil exposed to the air, and less area of water and swamp. Run-off has been increased a corresponding amount. Flood-heights have been materially increased by the greater facilities for drawing water rapidly to the streams. Snow conditions are not modified materially except in the small city areas, and the present crops perhaps require slightly less water than the original prairie growth.

Each state has its own peculiar conditions and must be studied independently. Mr. Rafter's observations are valuable for New York and for the same conditions elsewhere. His arguments are ingenious and his conclusions correct with the reservations he makes regarding insufficient data, but they must not be applied blindly to the different conditions in another state.

Filtration of ... Mr. Trautwine ...

portant part of the pure water problem in that city. Slow sand filtration is proposed. Mr. Trautwine shows that about one fifth of the population is wasting two-thirds of the water furnished and that a judicious expenditure for meters of $500,000 to $1,000,000 will prevent this waste. The economy of this expenditure is evident when it is shown that the cost of a filtration plant for the water used and wasted is, like the amount of water, three times that for water properly used. Nearly five million dollars must be expended in addition to the cost of filtration in extensions and improvements, on the present basis of waste, while a little more than one million is all that would be necessary without waste. Similarly, including the cost of maintaining meters, the cost of operation on the present basis is twice that on the proper basis. The difference between the installation of meters, filtration plants with required real estate and other requirements for a surplus of about 100 per cent. in pumping capacity ($4,605,500) for a supply with the waste restricted, and the same, except meters, required for the present use and unlimited waste ($12,509,500) is nearly $8,000,000. This sum is large enough to warrant the closest study of the problem.

While Mr. Trautwine's estimates may not be entirely unbiased, there ...

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up of the smaller tax-payers, be required to pay for the wanton waste of the small number of consumers who are guilty of this wholesale theft or criminal negligence? The fact that they pay large sums for the water used legitimately is no argument for permitting the waste of vast amounts of water for which there is no excuse. The argument that water should be as free as air, is too far out of date to be heard with patience. Certainly water is as free as air if one goes where the water is. Water taxes are not in payment for the water, they are only payment for the labor and expense of bringing the water to our doors. In the days when water is carried in carts, no one claims that the cost of water used or wasted by one man must be paid for by another. Each pays for the water delivered to him. Doubtless the large consumer pays less per gallon than the small consumer, but he pays for all he gets, and pays what it costs to get the water to him with a reasonable profit to the carrier. In what way is the supply of water by a city water-works system different in principle? It differs in fact only as the cost of delivery of water is so much decreased.

The use of meters cuts off the waste, but does not restrict the legitimate use of water. In fact, general experience shows that the introduction of meters usually leads to a very material reduction in water taxes, as soon as the leaks and careless practices which caused useless waste of water were discovered and stopped, without in the least interfering with the freest legitimate uses.

On a small scale this is shown in the city of Bloomington, Ill. Many houses now have a tax less than half that under the flat rates. To be sure the revenues of the water department are reduced, but so are the expenses in even greater ratio, so that the city's funds are not injuriously affected.

So valuable a reform is almost too much to ask of Philadelphia, which has given such recent evidences of the lack of knowledge among its law-makers of the first principles of municipal economy or even of common honesty. Mr. Trautwine's courage and perseverance are deserving of the greater commendation on this account.

Central States Water-works Association.

The proceedings of the first convention of the Central States Water-works Association showed sufficient interest in its objects to justify the efforts of its projectors. Although the actual registration was small, the attendance at the meetings was quite satisfactory. Although four or more states were represented, it is evident from the list of officers that Ohio is in full charge of the organization. There is a good field for such a society as this in Ohio and the adjoining states, and while considerable missionary work may be necessary for a few years, perseverance and patience will finally have their reward. The district

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covered by this society has many problems which are peculiarly its own, and the technical investigations will not be duplications of those in other societies, such as the New England Water-works Association, as most of them will differ either in the nature of the problem or the detail of its application. The New England society has materially elevated the standard of water-works operation in its district and the principal work of the new society will be in this line. Even if its field is restricted to the state of Ohio there will be plenty of work to do and plenty of water-works men to interest and to assist. As soon as the value of the society is made apparent by the work it does there will be plenty of requests for membership from the adjoining states. Good work in a good cause is always appreciated. The next meeting of the convention will be held in Cincinnati. John Fisher, of Hamilton, is the secretary.

A Municipal Lighting Contract.

The new lighting contract of the city of Boston contains many of the features of municipal control of what may be termed a natural monopoly which have been recommended frequently by this magazine. The contract fixes the price to be paid by the city for arc lights, within certain limits, proportional to the number of lights, and provides for readjustment of this price at intervals of five years, or of two and one-half years if the mayor demands it, so as to keep the net earnings of the company at 6 per cent. or less if the company's bonds are placed at a less rate. There is no regulation of rates to private consumers, and apparently no agreement to refuse franchises to other companies. The expenses are divided between the public and private lighting in proportion to the electrical power developed for each class of business, and the percentage of net earnings is computed from the earnings of the city lighting plant and the capitalization of that portion of the plant. Seven per cent. depreciation is allowed in determining the expenses of operation. Evidently the desire is to separate the municipal and private business as much as possible and to retain close control of the former, leaving the latter to the regulation of the company. The rates to private consumers may be fixed at pleasure by the company, and the profits of this portion of the business may be quite different from the 6 per cent. permissible on the city's business. Certain detailed technical demands are made on the company, one being that if the commission on rates reports that any new invention would reduce the cost of production of light or increase its efficiency, the company must introduce it or its equivalent, or the city may demand the estimated reduction in price which would presumably result by its adoption.

So far as public service is concerned, this places about all the restrictions on the company to which it should logically be subjected. It

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leaves the private business of the company unrestricted. Electric lighting is not strictly a natural monopoly, though restriction of service to a single company is by far the most convenient and satisfactory. If the monopoly of private business is not granted to the company, but the field is open to others who offer proper guaranties to the city authorities, no restrictions of the company's private business need be demanded. The contract seems to be quite satisfactory, and in the present condition of municipal government in this country is probably a better method of securing good service than municipal ownership.

LEGAL DECISIONS.

[Reported Specially for MUNICIPAL ENGINEERING.]

Right of Company as to Discounts—One entered into a contract with a lighting company whereby, in consideration of his agreement to take light for five years, he was to receive a certain discount on his bills. The discounts were allowed monthly. On his refusal to continue use of light within the five years the court held the company had a right to recover from him the discounts that had been allowed. Mo. Elec. L. & P. Co. vs. Carmody, 72 Mo. App. Ct. Rep. 534.

City Not Liable for Unexpected Freshets—Where a city has provided sewers or drains of ample capacity to carry off all water likely to fall or accumulate upon its streets on all ordinary occasions, it is not guilty of negligence in failing to anticipate and provide for extraordinary and unexpected stroms. Peoria vs. Adams, 72 Ill. App. Ct. Rep. 662.

City Responsible for Defective Methods of Construction—For a method of street construction which, under the natural and ordinary action of the elements, will render street travel dangerous, a municipality is justly subject to liability, when the dangerous condition arises as if it had actually created the dangerous condition in the first instance, without the intervention of the weather. Lehmann vs. City of Brooklyn, 51 N. Y. Supp. Rep. 524.

Power to Repave Streets—A power "to pave again any street on which the pavements are worn out and useless" necessarily carries with it the power to repave only portions of the street if the pavements are worn out on such portions. Burckhart vs. City of Atlanta (Ga.), 3 S. E. Rep. 32.

Measure of Damages for Change of Grade of Street—The measure of damages to a lot caused by a change of grade of the abutting street is the diminution in the value of the lot caused by such grading, less any special benefit that may have thereby accrued to the lot. Kent vs. City of St. Joseph, 72 Mo. App. Ct. Rep. 42.

Lien For Improvement, Though Assessment Is Invalid—If a sewer system is laid according to law there is a lien on the lands for the cost, although the assessment was invalid. Smith vs. Abingdon Sav. Bank (Mass.), 5 N. E. Rep. 545.

Assessments For Improvements Presumed to Be Regular—Assessments for public improvements are presumed to be regular; and in the absence of substantial injury courts will not be overzealous in finding technical reasons for declaring them invalid. Providence Retreat vs. City of Buffalo, 51 N. Y. Supp. Rep. 654.

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PERSONAL INFORMATION.

SCHENCK—Mr. Martin Schenck, city engineer of Troy, is the Democratic nominee for State Engineer and Surveyor of New York. He is a descendant of an old Dutch family, and was born forty-seven years ago. He was graduated from Union college in

MARTIN SCHENCK, C. E.

the class of 1869, and plunged at once into work as a civil engineer on the Sedalia branch of the Missouri, Kansas & Texas railway. For a year he held an important position on the Union Pacific railway, and as engineer in charge constructed a number of bridges along the line in the Indian territory. In 1872 he was engineer for the contractors who were building the third and fourth tracks on the New York Central railway. About this time he was appointed and acccepted the position of engineer on the Callao & Lima railway in Peru, but the death of his father forced him to abandon the enterprise. From 1874 to 1880 he devoted his time exclusively to hydraulic engineering and waterpower improvements. For a time he was employed by the contractors who were constructing the West Shore railway. From 1883 to 1891 he was attached to the Canal department and was intrusted with many important pieces of work. For four years, from 1887 to 1891, he was engineer in chief of the Hudson river improvement, and the lengthening of the locks in the eastern division of the canal was done under his direction. In 1891 he was appointed until May, 1895, he was consulting engineer to the state board of health and since May, 1895, he has been city engineer of Troy, N. Y. He has at various times been connected with the state national guard as follows: From 1864 to 1869, private in Fortieth regiment; from 1875 to 1877, brigade quartermaster with rank of captain in the Thirteenth brigade, and in 1894 he was appointed chief of engineers with the rank of brigadier-general on the staff of Governor Flower. He was born at Palatine Bridge, Jan. 24, 1847, received his early education in the schools of his native town, prepared for college at the Union school, Schenectady, and entered Union college in the fall of 1865.

ANDREWS—Mr. Horace Andrews, the city engineer of Albany, N. Y., author of the paper on "The Proper Curbing of Streets," read before the convention of the American Society of Municipal Improvements, and which appears in full in this number of Municipal Engineering, has held the official position which he now occupies since 1886. During that period several millions or dollars have been expended on public work under his supervision in Albany, and in its engineering features the Albany of today is largely his creation. He was graduated from the Sheffield Scientific School of Yale university, with the degree of civil engineer, in 1872. In that year he was engaged on hydrographic work, under the United States Coast and Geodetic Survey, and for several years afterward was connected with the same work,

HORACE ANDREWS, C. E.

first in connection with the survey of the harbor and vicinity of New Haven, Conn.,

sion of the work in 1884. He was then engaged in sanitary investigations under the State Board of Health of New York till his appointment as city engineer of Albany.

JENKINS—Mr. Warner H. Jenkins, C. E., contributor of the articles in the October and November numbers of Municipal Engineering on "Concrete Aggregates," has had many years of practical experience in the line of work which he writes about. He is a native of Philadelphia, and is about thirty-six years old. He graduated from the senior class of Newton school, 1879, and entered the University of Pennsylvania the same year. He finished a scientific course at Lauderbacher Academy in the fall of 1882. In 1882 he was appointed superintending engineer by the Portland Paving company of Delaware, at the same time holding the position of consulting engineer to the Empire Construction company of New York. He

WARNER H. JENKINS, C. E.

resigned these positions in 1888 and formed the Warner H. Jenkins company. Among the large and important operations, coming directly under his supervision, were the Pennsylvania Institute for the Blind, the Officers' and Engineers' Quarters at Fort Hancock, N. J., Broadway M. E. church and Ivy Hall building, Princeton, N. J. He was the first in his city to successfully demonstrate the practicability of concrete for foundation walls for large buildings in the construction of the Harrison building in 1894. He is the inventor of the methalithic system of paving and has laid millions of feet of street and sidewalk paving in different sections of the eastern states, and introduced granolithic in the New England states. He has been retained as an expert on many of the litigations touching upon the use of concrete.

WARING—Col. George E. Waring, M. Inst. C. E., consulting engineer of Newport, R. I., and famous as the stret cleaning commissioner of New York who cleaned the streets, has been in Cuba, by appointment of the governmont, investigating the sanitary condition of the localities where troops will be located when the American army enters the island. He will report recommendations for needed improvements in sanitary conditions.

CASE—Capt. L. N. Case, who, through unworthy political influences, was deposed from the position of superintendent of the Detroit water works after thirty-one years of efficient service, as stated in this department in the September number, has been appointed manager of the water works at Duluth, Minn., succeeding Mr. C. E. Van Bergen, who resigned.

Personal Notes.

R. M. Clayton, M. Am. Soc. C. E., has been re-elected city engineer at Atlanta, Ga.

A. R. Starkey, Marquette, Mich., has been appointed superintendent of water works at St. Paul, Minn.

Edwin Darling, formerly superintendent of water works at Pawtucket, R. I., died recently, aged sixty-four years.

George K. Crandall has been re-elected city surveyor and Alfred H. Chappell water commissioner at New London, Conn.

Thomas Fuller, late chief architect of the department of public works, Ottawa, Ont., died Sept. 28, aged seventy-six.

C. W. Hubbell has been appointed civil engineer to the water board at Detroit, Mich., to succeed Gardner S. Williams.

Herman Schussler has been made honorary professor of water supply engineering in the University of California, Berkeley, Cal.

Stevenson Towle, M. Am. Soc. C. E., has resigned his position as consulting engineer of the department of highways, New York City.

James W. Cheney, South Manchester, Conn., has been appointed a commissioner of the Connecticut bridge and highway district.

J. W. O'Neil has been appointed receiver of the Topeka Water company, Topeka, Kas., to succeed Elias Summerfield, resigned.

Charles Edward Widener, C. E., and city engineer at Cumberland, Md., in 1893 and 1897, died in that city, October 11, aged forty-five years.

C. G. Edwards has been appointed assistant engineer and Raleigh Thomas chief draughtsman of the subway commission of Baltimore, Md.

Charles E. White, electrical engineer of Philadelphia, Pa., has been appointed manager of the municipal light board, Wakefield, Mass.

David R. Lee, Asso. M. Am. Soc. C. E., has been appointed supervising engineer in the construction of the Bleecker reservoir at Albany, N. Y.

A. C. Bell, city engineer of New Orleans, La., has been studying asphalt pavements in Washington, New York City, Troy, Syracuse, Detroit and Chicago.

H. E. Wells, Columbus, Ind., has been appointed superintendent of the water works and electric light plant at Rushville, Ind., to succeed A. T. Mahin, resigned.

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Frank A. Foster, C. E., Dorchester, Mass., is a candidate for the state legislature of Massachusetts. Mr. Foster served for fifteen years in the office of the city engineer of Boston.

Major-General Francis V. Greene, U. S. V., has been ordered to report to Major-General Lee, Jacksonville, Fla., for assignment to the command of a division of the Seventh Army Corps.

W. S. M. Kirchofer has resigned his position as city engineer at Baraboo, Wis., and has been engaged at Superior, Wis., to analyze the city's water and to suggest plans for purification.

Henry Goldmack, M. Am. Soc. C. E., has been elected secretary of the Detroit Engineering Society, to succeed Gardner S. Williams resigned. Mr. Williams has removed to Ithaca, N. Y.

John P. Kelly, C. E., Troy, N. Y., died Sept. 27. Mr. Kelly was a graduate of the Rensselaer Polytechnic Institute, had been an engineer for the public improvement commission and assistant state engineer.

Walter H. Richards, engineer of sewers at New London, Conn., has been elected superintendent of water works. Mr. Richards was constructing engineer of the New London water works, and on their completion was appointed superintendent, which position he held for twenty-two years. His impartial administration gave offense to some persons, and five years ago he was retired from office on a change in the city administration. His reinstatement by the new council is regarded as a righting of a mistake due to bad politics.

A. S. Crane, Jun. Am. Soc. C. E., has resigned his position as assistant engineer of the department of sewers, Brooklyn, N. Y., and accepted that of assistant engineer of the American & Lake Superior Power Co., Sault Ste Marie, Mich.

R. Krumm of Columbus, O., has been engaged as chief engineer of the Corean government, and will direct all engineering work, such as laying out of irrigation works, roads, bridges, fortifications, etc.

William Jackson, M. Am. Soc. C. E., city engineer at Boston, Mass., has gone to Europe to examine and study certain bridges for the purpose of obtaining information for use in connection with his work as engineer of the Cambridge bridge commission.

G. H. Dunlop, C. E., Melbourne, Victoria, Australia, is in this country studying American methods and machinery for the excavation and handling of material, including steam shovels, grading machines and conveying plants, with a view to introducing them in Australia. Mr. Dunlop is the inventor of a new form of wooden lining for tunnels, which has been used in the construction of sewer tunnels in Melbourne.

CURRENT INFORMATION.

New Tenants Not Liable for Water Bills of Old Tenants.

A decision was rendered recently by Justice Childs in the special term of the supreme court, in the case of the receiver for the Busch Brewing company against the Municipal Board of Tonawanda, N. Y. The suit resulted from the refusal of the board to turn the water on at the brewery because there was an unpaid water bill, contracted previous to the appointment of the receiver, which the receiver refused to pay. Justice Childs held that the board could not hold the new tenant responsible for the bills of the old tenant, and that it had no right to deprive the new tenant of the use of water because the old tenant's bill was not paid.

It would seem that this decision would be far-reaching and compel other cities to abandon that method of collecting unpaid water bills. Buffalo, however, whose rule for years has been similar to that declared be paid. Generally, the new tenant would pay the city for the water, supposing he had no redress. It is probable that another test case will be taken before the court before the question will be finally settled.

Meeting of Central States Water Works Association.

The first annual convention of the Central States Water Works association was held at Springfield, O., Sept. 27-29. In a paper on electrolysis and water supply J. J. Pater, Hamilton, O., made a plea for greater attention to the damages to water pipes due to wandering currents from electric railways. The executive committee for the coming year was appointed a committee to investigate the subject thoroughly. In the portion of his paper pertaining to water supply Mr. Pater called attention to the pollution of streams by sewage, and urged some action toward preventing it. R. H. Flynn

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"The Idiocies of the Water Consumer" was discussed by C. W. Wiles, Delaware, O., in which he pointed out the unreasonable demands made by some people who are given the best of service, and giving as an instance a case where complaint was made of bad odor in the water, which proved to be due to bad plumbing.

John Fisher, Hamilton, presented a paper on "Repairing a Break Under Eighteen Feet of Water." H. Stillwell, Marion, O., discussed "Misuse of Water in Flushtanks," and J. J. Hopper, Springfield, "Sanitary Condition of Water Supply."

Officers for the ensuing year were elected as follows:

President—G. R. Cook, Toledo, O.
First Vice-President—C. W. Wiles, Delaware, O.
Second Vice-President—Jas. P. Meloy, Sidney.
Third Vice-President—Geo. S. Cotter, Springfield.
Fourth Vice-President—A. W. Inman, Massillon.
Secretary—John Fisher, Hamilton.
Treasurer—Chas. E. Rowe, Dayton.
Editor—J. J. Pater, Hamilton.
Executive Committee—Wm. A. Veach, Newark; C. W. Koons, Mt. Vernon; Jerry O'Shaughnessy, Columbus.
Finance Committee—W. B. Mitchell, Piqua; Jas. P. Meloy, Sidney; C. F. Martin, Bellefontaine.

The next meeting of the association will be held in Cincinnati.

Sources of Water Supply in Ohio.

A preliminary report of the investigation of rivers and deep ground waters of Ohio as sources of public water supply, has been issued by the Ohio State Board of Health. The Mahoning river above Youngstown was found to be simply one vast sewer. The sewerage of Youngstown reaches the Mahoning river, but has not yet polluted it to an extent to cause serious complaint. No town in Ohio draws a water supply from the Mahoning river below Youngstown.

Reduction of Water Rates at Kansas City.

A horizontal reduction of 15 per cent. in water rates to all consumers has been determined upon at Kansas City, Mo. An ordinance was passed, Oct. 3, by the upper house of the council, which goes into effect Jan. 1, 1899. The reduction applies to meter rates as well as all others and on the basis of the revenues for last year it will reduce the revenues from the plant between $60,000 and $70,000. As the consumption of water is constantly increasing, the reduction for the current year will amount to about $55,000. This is offset to the extent of about $25,000 by the new business which the special rates ordinance will effect. An amendment has been adopted providing that the horizontal reduction does not apply to the special rates fixed by the special rate ordinance. This special rate ordinance, brief mention of which was given in the October number of Municipal Engineering, provided a rate of 5 cents per 1,000 gallons to all consumers using between 10,000,000 and 25,000,000 gallons of water a month, and 4 cents for more than 2,500,000.

City Must Pay for Public Use of Water Under Municipal Ownership.

An opinion was prepared by Assistant Corporation Attorney Taylor, Oct. 6, for the board of water commissioners and the board of aldermen of St. Paul, Minn., in which he holds that the various city departments will have to pay for water furnished them the same as private persons. The city is charged with $418,088 for water used through fire hydrants from Dec. 1, 1891, to June 1, 1898.

Water Filtration at Hamburg.

Considerable attention was devoted to filtration by Senator William Flinn of Pittsburg, Pa., while on a recent visit in Europe. The sand filter in operation at Hamburg interested him particularly. He said the water when first taken from the river is quite filthy, and when it comes out of the filter is as clear as crystal. The plant has a capacity of 60,000,000 gallons of water a day, and cost $4,000,000.

A City Allowed to Enter the Territory of a Private Water Company.

In an application of the North Springs Water company for an injunction restraining the city of Tacoma, Wash., from extending its mains to the territory alleged to be covered by the Fuller and Mullen franchises, Judge Carroll ruled that the city cannot be estopped from entering the field of any rival water plant it may choose, but it cannot take or destroy the property of such plant without due compensation. Judge Carroll said, in part, there is no obligation resting upon the holder of either of these franchises compelling it to put in any water works; the city has said to it, "you may put in water works," but it has not said "you are compelled to do so." No bond has been required; the holder of the franchise may put down pipes on one street and not upon another; he may supply the people upon one street and not upon another; he may shut down his works at any time and remove his plant; he is not compelled to continue for

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any length of time; the city receives nothing in return for the privilege except it be the right to make uniform rates at which water shall be furnished by such corporation, company or individual. While the franchise granted is a contract—and the city is bound by it, and whatever interpretation it may have, whatever rights are granted by it, the plaintiff is entitled to them—yet it is not of the character of a contract under which courts have held the city estopped.

Average Daily Consumption of Water Per Capita in English Cities.

An official statement of the average daily consumption of water per capita in a number of the leading cities of England, including the average for the several water companies which supply London, is as follows:

	Gallons per head.
Grand Junc. (London)	55½
Chelsea (London)	47
Southward and Vauxhall (London)	45
Brighton	43
Plymouth	43
Hull	43
London (average)	41
Lambeth (London)	40
West Middlesex (London)	39
New River (London)	35½
Bradford	35
Leeds	35
East London (London)	34½
Preston	34
Kent (London)	33½
Liverpool	31½
Croydon	31
Manchester (aver 27)	30
Halifax	29
Swansea	28
Blackburn	25
Bristol	23½
Bolton	23½
Birmingham (average)	23
Huddersfield	23
Burnley	23
Oldham	22
Cardiff	22
Sheffield	21¾
Nottingham (aver. 17½)	19
Birkenhead	18
Leicester	18

Information About Water Works in Europe.

The Philadelphia Commercial Museum is compiling detailed information regarding the water works systems of Europe. A series of questions was prepared and submitted to the Water Department of Philadelphia for revision and suggestions. The and other countries. Exhaustive replies have been received so far from Manchester, Birmingham, Liverpool, Glasgow and Cardiff in Great Britain, and from Frankfort-on-the-Main, Nuremburg, Zurich and Geneva. The replies give voluminous information about the cost, methods of operation and results, with full descriptions of filtering and purifying plans where they are in use. Annual reports of operations accompany the replies of some cities to the questions.

Proposed Investigation of Water Contracts in New York.

The private water companies in New York City have been brought into prominence by Edward M. Grout, president of the borough of Brooklyn, who introduced a resolution recently asking that the department of water supply investigate the terms of the contracts which these private concerns furnishing water within the city limits hold. Mr. Grout favors the acquisition of the plants, and in time placing within the city authorities' hands full control of the water supply in the five boroughs of Greater New York.

A Court Decision on Sewer Assessments.

Judge Spiegel has rendered a decision in a suit against the city of Cincinnati to recover the amount of the assessment for the construction of the Denman-st. sewer. The plaintiffs objected to the payment of the assessment because their property had local drainage, and the improvement, therefore, was unnecessary; also, because the entire length of Flint-st. had been included in the original assessment to be levied upon the district through which the Denman-st. sewer was built, but in the ordinance Flint-st. was excepted and the cost placed on the other property-owners in the sewer district. Judge Spiegel held that lots or lands not needing local drainage meant lots or lands so situated as to drain themselves by natural drainage into rivers, creeks and other receptacles. He found, from the evidence in the case and from a personal inspection, that there were no improvements on the lots, and, therefore, no sewer was needed; but he found them not to be within the exception, for the reason that the specific power granted a city to construct sewers

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they will receive the benefit of the sewering done by the direction of the city. He found further that the natural rule of law underlying assessments was based on benefits to the taxpayers who paid the assessments levied. When taxed for the building of a sewer which drains an entire district their benefit is that of an adjoining lot owner who is taxed for the special benefit he derives from the sewer; but when it is proposed to tax him for the benefit of tax-payers on a street which is excepted, yet which is within the sewer district, this rule of law does not apply and there ought to be a reduction of the assessment. Judge Spiegel directed the reduction to be in the proportion that the excepted street would bear to the whole district, about 70 cents per front foot, and that that amount be paid to the contractor out of the general sewer fund of the city, which excepted the street from the burden it should have been made to bear.

Damage Suits May Be Brought Annually Until a Sewer Is Built.

The suit of Dowling vs. the city of Chattanooga, in which the city sought to enjoin Mr. Dowling from bringing further suits on account of the Washington-st. sewer, contending that he had, in previous suits, recovered damages in excess of the value of the property, the supreme court dismissed the injunction, thereby allowing Mr. Dowling to bring a new suit each year on account of this sewer. This decision, together with a previous decision regardng the same sewer, wherein it was held that a tenant on property affected by the sewer could recover damages, will render imperative the immediate building of the sewer.

Pollution of the Mississippi by Chicago.

A resolution has been adopted by the board of health of St. Louis, Mo., asking Congressman Bartholdt to introduce in Congress a bill to stop Chicago from emptying its sewage into the Illinois and finally into the Mississippi. The medical members of the board, Drs. Starkloff, Hughes and Grill, agree in the opinion that the effect of the operation of the canal will be to pollute the water supply of St. Louis.

Chicago Property-Owners Will Seek Information About Improvements.

A plan of investigation of public improvements in Chicago, Ill., will be formulated by the public service committee of the Real Estate Board of that city. Chairman C. H. Millikan and Robert C. Givens have prepared a schedule of the resolutions adopted as follows:

To investigate cost by private contract by reliable contractors of different sections of the country.

Cost of laying plank, cement and stone sidewalks.

Cost of paving streets with vitrified brick, asphalt, macadam, cedar blocks and granite blocks in places where there are the same facilities as in Chicago.

Cost of various foundations under these pavements.

Cost of laying tile drains and building sewers of various kinds and dimensions.

Cost of erecting lamp posts of various kinds and connecting same with mains in streets.

Cost of laying water mains and laterals; also stubs connecting lots with mains in streets.

The board of local improvements will make a statement with reference to the cost of street improvements in Chicago. Exception was taken to the action of the Real Estate Board by Commissioner McGann, who asserts that improvements cost less in Chicago than in any other city in the country.

Electrolysis in Logansport.

The recent investigation of the electrical experts for electrolysis in the underground pipe system in Dayton, O., led City Engineer Osmer of Logansport, Ind., to make an investigation of the pipes in that city. Honeycombed pipes had caused the city much annoyance for several years, but the trouble was attributed to an inferior quality of pipe. In excavating for repairs to the natural gas mains Oct. 8 City Engineer Osmer found that nearly 70 per cent. of the current from the street car rails is passing along the pipes, and that some of the pipes are affected which have not been underground three years. One piece several feet in length was taken out, which resembled an old, rusty piece of iron eaten full of holes.

Cable Cars Blockaded in St. Louis by the Caving In of a Sewer.

Sewer Commissioner Colby at St. Louis, Mo., kept the cars of the Broadway cable line at a standstill for nearly two hours Oct. 7. A sewer caved in on the west side of Broadway near Palm, and a wagon and two horses were thrown into the hole. When Commissioner Colby arrived on the scene of the accident the Broadway cars were running by the cave-in, which was fully fifteen feet deep. Passengers, not realizing that the break was liable to extend and ingulf the cars and all on board at any minute, leaned from the car steps and gazed into the deep hole. Commissioner Colby gave orders to

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stop the running of cars. The superintendent refused to comply with the order and motioned a car to come ahead. Commissioner Colby thereupon threw a timber across the track and deliberately stood upon it, effecting a blockade of the road. The officials of the company pleaded that the stoppage was costing them $100 an hour, and offered to assume all responsibility entailed by allowing the cars to proceed, but Commissioner Colby remained obdurate. He did not permit it until the horses had been removed and the dirt walls well braced.

Legal Difference Between "Ordinary Repairs" and Repavement.

The supreme court of Nebraska handed down an important decision recently in the case of Edward L. Robertson vs. the city of Omaha. The suit grew out of the repaving of Leavenworth-st. with brick. The street was originally paved with wooden blocks, which wore out in a comparatively short time. The council, acting on a petition of the property owners, ordered the blocks torn up and brick pavement laid. The costs of the improvement were assessed against the adjoining property. Several property owners objected to the assessment and brought suit to have it declared illegal. The district court decided against the plaintiffs and the supreme court has affirmed this decision. The contention in which the city was most interested was that the repaving was "ordinary repairs," the cost of which, under the charter, cannot be assessed against the abutting lot owner, but must be paid by the city. The court holds that the costs of "ordinary repairs" must be paid by the city. but that the tearing up of worthless blocks and replacing them with vitrified brick laid "on the old base" is not an "ordinary repair" within the meaning of the statute, but is a repavement of the street. To pay the costs, therefore. a special assessment may be made against the adjoining property. The importance of the decision lies not only in the fact that the cost of the Leavenworth-street paving can be assessed against the property owners, but also because the city it was assessed for duty at $1.50 per ton, under paragraph 93, act of July, 1897, as crude asphalt not specially provided for. The importer protested against this assessment of duty, claiming that the asphalt was dutiable as crude earth, at $1.00 a ton, in the same paragraph. The United States chemist has reported that the earth is "a limestone asphalt, containing 6.8 per cent. of asphalt bitumen." Paragraph 93 contains a provision for "limestone rock asphalt containing not more than 15 per cent. of bitumen, fifty cents per ton." The Board of General Appraisers therefore hold that the merchandise is dutiable, not as crude asphalt nor as as crude earth, but as limestone asphalt, at 50 cents a ton. The protest of the importer is therefore overruled.

The Paving Company Must Be Paid in Full.

The supreme court decided against the city of Chattanooga, Tenn., Oct. 8, in the case of the Southern Paving company, which sued the city for the balance of $6,000 held back by the board of public works on the Whiteside-st. paving contract. The board contended that the paving did not meet the specifications of the city, and declined to pay the 10 per cent. held back. The chancellor decided in favor of the city, but the court of appeals reversed the decision and the supreme court sustained the latter decision. The city will be compelled to pay the $6,000 and six years' interest to the assignee of the paving company, amounting, with costs. to more than $8.000.

Proposed Comparison of Asphalt Pavements.

The discussion of the asphalt question by the contract committee of the General Council at Louisville, Ky., resulted in the Barber Asphalt Paving company offering to lay one-half of Third-st., in front of the Board of Trade building, if the Breckenridge company will lay the other half, in order that the two pavements may be compared.

Study of Questions Relating to Paving Brick

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to be selected, is proposed on the balloting paper, but the voter is permitted to suggest some other subject in place of these. The list is as follows:

1. Investigation to determine the influence of weathering on brick subjected to the rattling test.
2. Investigation to more carefully determine the feasibility of using mixed charges of iron and brick in the rattler test.
3. Investigation to determine the best form and dimensions for paving brick, in order to enable them to endure the standard rattler test.
4. Investigation to determine what effect the process of manufacture may have on the ability of burned clay to resist frost.
5. Investigation into relation between a clay's composition and its speed and safety in drying.

Good Roads Meeting at the Omaha Exposition.

The National Road Parliament met Oct. 8 in the Nebraska building at the Trans-mississippi Exposition, Omaha, Neb. A ;permanent organization was effected, with the Hon. Martin Dodge of the bureau of inquiry, Washington, D. C., as president, Prof. W. M. Hays of Minnesota, secretary, and A. B. Dunning of Pennsylvania, recording secretary. D. V. Purington, Galesburg, Ill., read a paper on "Good Roads," in which he held that no country had done so much for internal improvement and so little for external improvement as the United States. He favors congress taking up the matter of good roads and making proper appropriations to carry on the work of investigation through the department of agriculture.

Resolutions bearing on the subject of good roads were introduced by Thomas Shackleford of Missouri, W. M. Hays of Minnesota, Prof. Luten of Purdue university, Lafayette, Ind.; Otto Dorner of Milwaukee, E. G. Harrison of New Jersey and James R. Dunn of Ohio. In a paper on "State Aid to Roads and League of American Wheelmen Work" Otto Dorner, chairman of the national committee for highway improvements of the League of American Wheelmen, cited the fact that it now costs 25 cents per ton to transport one mile in this country, owing to bad roads, while in Europe it costs only 8 cents per ton.

Gen. Charles F. Manderson, ex-president of the Good Roads Association, said the towns as well as farmers make mistakes in laying out streets and roads on section lines due east and west, when many times, by varying the lines, nature would have provided better streets and roads with easier grades and more pleasant surroundings.

James R. Dunn, ex-president of the League of American Wheelmen, thought that the railroads had begun to realize that good roads were profitable feeders of their lines and favored them.

Short addresses on good roads and the best methods of obtaining and maintaining them were made by A. B. Dunning, Scranton, Pa.; J. W. McCaller, Atlanta, Ga.; Prof. W. R. Hoag, Minneapolis, Minn.; W. H. Moore, president Good Roads Improvement Association of Missouri; G. W. Shields, Hannibal, Mo.; W. M. Hays, Minnesota; E. G. Harrison, New Jersey. The parliament adopted resolutions as follows:

1. That the parliament approve of the good work of the department of agriculture in furnishing information relative to good road work.
2. That each state agricultural college furnish a course on good road construction.
3. That the state legislatures be asked to appropriate funds to aid counties in building samples of good roads.
4. That congress be asked to make the good road inquiry department a permanent division of the department of agriculture.
5. Recommend that directors of farmers' institutes take up the subject of good roads as a part of their work, and that the United States department of agriculture furnish lectures on good road building.
6. All able-bodied men in prisons be kept at work on road material and not be allowed to come in competition with honest laborers.
7. That construction of good roads by country districts be encouraged.
8. That the efforts of the office of Road Inquiry and the League of American Wheelmen be heartily approved.
9. That all states create a non-partisan highway commission, to be separate from all other boards, which shall have supervision of all public affairs.

An Experiment in Paving at San Francisco.

Mayor Phelan of San Francisco is having constructed in front of his building at Market-st. and Grant-ave. an experimental piece of paving 303 feet in length and extending from the curbing to the cable track. The pavement is of redwood block on Portland cement concrete foundation. The blocks are 6 in. square, are boiled in asphalt free from paraffine compounds, and will be laid with the grain of the wood perpendicular to the foundation; all joints will be filled with a mixture of asphaltic cement free from water, the whole to be covered with powdered limestone heated to 350 degrees Fahrenheit; the surface of the blocks will be covered with clear, hot sand and will be uniform in appearance with the contiguous pavement. The pavement is laid exactly as wood block pavements are laid in New York, London and Paris. The action of the supervisors in excluding wood, asphalt, brick and other modern pavements from the city

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specifications led Mayor Phelan to make a test of this pavement on a long street. He considers the bitumen pavement being laid on Market-st. the best piece of work done recently in the city, and decided that by laying the wood block pavement the public would have an object lesson in the comparative merits of the pavements before them. The city has agreed to accept the pavement if it proves satisfactory.

Road-Making Material in Porto Rico.

According to General Roy Stone road building is easy and inexpensive in Porto Rico. A goat-path hugging the steep hills lying between Adjuntas and Utuado, ten miles apart, was converted in six days into a road fit for army wagons. An abundance of rotten granite is found in this section, which yields readily to the pick and shovel and forms an excellent road material. Gen. Stone estimates that roads could be built almost anywhere in the island for from $750 to $1,009 per mile with native labor, which is satisfied with 20 cents per day in American money.

Plans for Subways in Large Cities.

The Cosmopolitan Magazine offers a prize of $250 for the best essay on the economic arrangement and construction of subways, for carrying the sewers, water, gas, etc., in great cities.

Illegal Award of Bridge Contracts.

Judge Payne granted an injunction Oct. 10 restraining the sanitary board from carrying out the contract for the eight-track drawbridge which is to cross the Chicago drainage canal near Campbell-ave., in Chicago. The contract was awarded to the Scherzer Rolling Lift Bridge Co., although two minority reports were presented in favor of the Strobel & Schinke designs. C. L. Strobel was the lowest responsible bidder at $690,000, but his bid was on a new design, and provided for a center pier 8 feet wide, with two waterways 80 feet wide. The engineers of the interested railways estimated its ultimate cost at $1,069,393 instead of $690,000, while the chief engineer of the sanitary district estimated the ultimate cost of the Scherzer bridge to the district, including a capitalization for payment to the railways unless the design was selected in advance the terms and conditions were necessarily incomplete. On these grounds the court held that the award of the contract was invalid.

Officers of American Society of Civil Engineers.

The officers of the American Society of Civil Engineers for the coming year have been named by the nominating committee, and will be voted on Jan. 18, 1899. The nominees are: For president, Mr. Desmond FitzGerald, Boston, Mass.; vice-presidents, Mr. Robert Cartwright, Rochester, N. Y., and Mr. Robert Moore, St. Louis, Mo.; treasurer, Mr. John Thomson, New York City; directors, Messrs. John A. Bensel, C. W. Buchholz and Samuel Whinery, New York City; Mr. Edmund K. Turner, Boston, Mass.; Prof. Palmer C. Ricketts, Troy, N. Y., and Mr. James D. Schuyler, Los Angeles, Cal.

Asphalt Paving in New York City.

A somewhat sensational political controversy has been in progress in New York City during the closing weeks of the campaign over asphalt paving. The Tammany administration has attacked the work done under the reform regime of Mayor Strong, and charges that exorbitant prices were paid, insinuating that this was through some collusion, an investigation of which has been authorized with an appropriation of $150,000 for expenses. It is charged that the prices paid under the preceding administration were about $1 a square yard higher than in other cities. The prices paid under Mayor Strong's rule ranged from $2.53 to $3.10 per square yard. This, however, was based on a guaranty of the pavement for fifteen years, with the provision that the city should retain 30 per cent. of the contract price for five years, and then pay it in ten annual installments. In answer to the attack of the Tammany administration, it is stated that under Mayor Strong there were lower prices and more competition on asphalt paving than under his predecessors.

A fair comparison cannot be made between New York and other cities without taking into consideration the conditions affecting the work. It costs more to do work in New

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one-third of the price for most of the fifteen years must be taken into account, as the contractor could thus figure on getting only about $2 a square yard for the immediate work, which is about the price paid in other cities where the guarantee is for a short period. Still other considerations to be taken into account in New York as exceptional in comparison with smaller cities are the higher taxes on higher valuation of plants; the higher rents; higher prices of labor, and sometimes for shorter hours; the removal of excavated earth, much of which must be carried out to sea in scows; the long haul of paving materials, where the asphalt plants are often several miles from the place where the pavement is to be laid, and the heavy ferriage expense from plants across the river, amounting to from $40 to $60 daily. A detail of these differences is suggested by the Engineering News, which, in pointing out the unfairness of comparison between New York and other cities without taking into account all considerations, says: "To compare the $3.10, therefore, with work done in other cities with a shorter time-repair guarantee or no guarantee at all, and with light street traffic compared with New York, is evidently unfair. In New York other conditions also call for a relative higher price per yard. The grading of the street requires the removal of from 12 to 18 inches in depth of soil, and to get rid of this dirt costs from 50 to 60 cents for every square yard of asphalt laid. In other cities this cost may range from 8 to 15 cents." To those who know what paving should reasonably cost the New York prices will not be so questionable as the appropriation of the enormous sum of $150,000 for an investigation inaugurated on the eve of an election.

Gen. C. H. T. Collis, commissioner of public work under Mayor Strong and the reform citizens' administration of New York, which directed the city affairs between the last and the present administration of Tammany hall, furnishes the following statement regarding the charges affecting his department: "During Mayor Strong's administration about twenty millions of dollars were spent by the public works department. If the charge is true that the price paid for asphalt is too high what shall be said about its cost before Mayor Strong came into office, when prices were 30 per cent. higher? To compare our prices with those paid by other cities is the merest nonsense. Unless the traffic is exactly similar and the guaranty of maintenance is for precisely the same term of years, no comparison can be made. For instance, Fifth-ave., over which 18,000 vehicles pass daily, cost nearly $5 a square yard, while One Hundred and Twenty-sixth-st., over which perhaps less than 500 pass, cost only $2.53 for exactly the same pavement. When asphalt was first introduced into this city competition was opened to all the world. Tammany hall, however, restricted bids to particular brands of asphalt, which enabled the contractors who owned these deposits to make their own prices, and this was the condition of affairs when Mr. Brookfield and I came into office. We at once called together all the people who were willing to compete on fair terms, and this meeting resulted in such a modification of the specifications as produced honest rivalry and low prices. Tammany hall paved the west side of the Boulevard from Ninety-second to One Hundred and Eighth-st., in 1893, at a cost of $3.85 per square yard. I paved the east side of the avenue, from Ninety-second to One Hundred and Sixth-st., in 1896, at a cost of $2.98 per square yard."

MACHINERY AND TRADE.

Mineral Rubber Coating for Water Pipes and Reservoir Lining.

An eight page circular has been published

supply system of that city. He strongly indorses it and in Minneapolis specifications it was made the standard as a pipe-coating

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He adds: "Coating covered pipe splendidly in all cases and somewhat thicker for the 300 degrees temperature and stood hammer test perfectly. The material is so elastic that, by cutting into the coating and entirely removing some of it, the opening can be covered by simply hammering the edges around the space so that it is impossible to see the point. The coating did not foam even up to a temperature of 700 degrees F."

Mr. Cappelen further says that the coating was not affected by the muriatic, nitric and sulphuric acid tests, and he is responsible for the statement that "it is probably the best coating ever put on the market, not barring the so-called Sabin japanning process."

The manufacturers say that it is made "from asphalts and mineral rubber from their mines in Utah, is refined to 99.9 per cent. pure, is unaffected by acids, earth salts, water, electrolysis, earth currents, frost or heat, or any conditions to which it is likely to be subjected; is ductile at a greater range of temperature than any other material known to science, hence will not crack or peel off, or run in the hottest sun; is a perfect insulator. Being impervious to water, acids, etc., without brittleness, it follows as a matter of course that it is the perfect protector of metals against rust, etc. It is easily and cheaply applied, without waste, as there is absolutely no sediment of earthy matter so common in all other coatings. The old process of coating pipes with coal tar products, while making them look bright in transit, is attended by great danger, because the process of disintegration of the metal sets in when there is no opportunity of inspecting or remedying the evil, and has no other advantage except cheapness, and it is a well known fact that the coal tar pitch used today is of a much inferior grade to that used ten to fifteen years ago, due to the difference in the process of gas making, the increased temperature used causing destructive distillation, and cracking up the hydro-carbon into a new and worthless series. So much care is necessarily observed by engineers in the selection of the pipes themselves that the kind of coating for their preservation should be likewise carefully selected, and a coating not used merely on account of cheapness alone. To the cost of such cheap coating—if it does not prevent pipes rusting or being affected by water, acids, electrolysis, present high standard will always be maintained."

The following is recommended by the company as the best method of applying the coating to pipes: "Having the proper vertical dipping tank, bring the pipes to a temperature of 350 degrees to 400 degrees F., either by internal gas jet, or other flame, or by heating them in an oven, then dipping them into the dipping tank, thoroughly immersing and leaving pipe in dip until it has acquired the same temperature as dip. Then slowly withdraw the pipe (about 25 to 30 feet per minute) so that the surplus material may be drawn off by capillary attraction of the dip itself, thus preventing unequal accumulation at different points of pipe, and making a smooth coating all over. When the pipe has been raised out of the dip, it should be left to drain a few minutes, the thickness being tested by measuring and if it is found to be less than 1-64 of an inch, or if, in consequence of air bubbles or moisture in the dip, it shows any effect of foaming or pin bubbles, the pipe should be immersed again quickly, and withdrawn slowly, so as to accumulate at least 1-64 of an inch of the dip on the pipe, but 1-32 of an inch is still better. It is then allowed to cool before laying down." It is claimed that dipping pipes vertically can be accomplished much more expeditiously than dipping horizontally, and there is further advantage in getting a more even distribution of the material. A tank is made specially for this method of dipping and has been adopted by several manufacturers.

Information is also given as to the use of the material in field work, when pipes are taken to the location where they are to be laid, riveted together and tested. For the purpose of covering the rivets and joint work, or in places where the dip has been damaged in transit, a special field pipe-coating is furnished, made as a thick paint, air-drying. The manufacturers say regarding this: "Should this special field coating become too thick to use, it may be thinned by stirring in sufficient turps to make it easily workable, care being taken not to thin it too much, as it is essential that a coating of not less than 1-64 of an inch be applied on these joints, both inside and out. This special coating containing turps, makes it necessary for care to be exercised in the pipe so as not to have an unprotected light

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coating has been accidentally, or otherwise, removed; this field coating should be applied both inside and outside of the pipe, to repair all such defects. If this is carefully done before back filling, and the back filling carefully done to prevent damage to the coating, this pipe will remain protected for an indefinite period."

The Assyrian company also makes strong claims for its reservoir lining material, which it calls mineral rubber asphalt reservoir cement. It is stated that it may be used alone or mixed with pure silica sand. It is claimed for it that it is 99.9 per cent. bitumen. The directions given for its use are as follows: "See that surface is dry and clean, and, if concrete, leave with rough cement finish. For two-coat work, the first coat should be thinned down by adding about 25 per cent. of our No. 1040 maltha flux, applied at about 300 degrees F., with mops or brushes, similar to mopping roofing pitch. The second coat to be applied at about 325 degrees F., without any fluxing, in the same manner as the first coat, care being taken at all times to have the mopping done evenly, so as to leave no pin holes or air holes. If hot iron is used for smoothing the surface, it must not be above 400 degrees temperature."

Proposed Combination of Paving Brick Manufacturers.

Associated press reports, under date of October 27, state that William G. Hipp, of Massillon, who has been a prime mover in the organization of the brick trust, says that it will be a combination of paving brick and not fire-brick manufacturers, as previously reported. He says that he has arranged in New York for $15,000,000 needed to finance the plan. Other reports attribute to the movement almost incredible magnitude, as, for instance, a telegram from Zanesville, O., states that the organization will embrace all the factories making modern clay-working machinery, thus shutting off independent concerns from equipping themselves with machinery that would make competition possible. Mr. Hipp is credited with saying that there is no intention of increasing prices, but the purpose is to prevent their being cut. Authoritative information cannot be obtained regarding the project at this time.

Information About Water Works Appliances.

A handsome new catalogue has been issued by the Coldwell-Wilcox company of Newburg, N. Y., illustrating and describing their gate valves, sluice gates, expansion and flexible joints, cast iron flanged pipe and fittings for high pressure, water catchers, separators, screens and special appliances for water works, manhole covers and frames, etc. In addition to information as to improvements in these various appliances, and explanation as to their special merits, the catalogue contains matter of interest to water works people. Those who wish to keep themselves well equipped for emergencies and for consideration of such matters will find it desirable to have it at hand. Copies can be obtained gratis by addressing the Coldwell-Wilcox company, Newburg, N. Y.

Spiral Riveted Pipe for Water Works Construction.

The great strength and long life of Root's spiral riveted water pipe, the ease with which it may be handled, and the fact that it is not liable to give trouble through leakages, make it especially desirable, the manufacturers claim, for water works construction. The Abendroth & Root Manufacturing company, 28 Cliff-st., New York, the sole manufacturers of the pipe, report a number of large orders recently received for this particular service. To the Sheely & O'Shee company, contractors, of Lincoln, Neb., they have lately shipped 12,000 ft. of spiral riveted pipe which will be used in extending the water works at Lanesboro, Minn. About 10,000 ft. have been sent to Milledgeville, Ill., and 15,000 ft. to the city of Augusta, Wis. The U. S. Water and Steam Supply company, contractors, Kansas City, have placed an order for about 5,000 ft. of pipe which will be used at Concordia, Mo., and 6,500 ft. are to go to J. L. White, contractor, Wyoming, Ill.

The Cement Plant of the Illinois Steel Company.

The Illinois Steel company has issued a handsome illustrated pamphlet descriptive of its various plants, their capacity and methods of operation, which is of much interest. The vast operations of the company are suggested by the descriptions, but they are so modest in statement that the ordinary reader will not grasp their immensity. In connection with the oldest and smallest plant of the company, the North Works, a cement plant has been established. Here there are two blast furnaces for the production of pig iron. The ore limestone and other materials used in these furnaces are specially selected with reference to the composition of the resulting slag, so that in addition to the iron a valuable cement product is obtained. A description of the process is given in the pamphlet showing why the cement made

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here is so much more valuable than the ordinary slag cements, and giving the reader the impression that careful inspection of processes and analysis of materials and product should insure uniformly good cement.

The Jeffrey Columbian Separator for Cement Manufacturers.

An attractive little pamphlet has been issued by the Jeffrey Mfg. Co. of Columbus, O., describing the Jeffrey Columbian separator, screen and bolter for the manufacture of cement. Many points of superiority are claimed for it, among which are the following:

"It has the greatest capacity per square feet of cloth; the meshes in the cloth never clog or close up; the cloth wears from four to six times as long as any other of the same capacity; different grades of fineness can be bolted without changing cloth; it takes less power than any other; the cloth can be 20 to 40 meshes coarser than fineness of product required; it requires less space in mill for same capacity; two to three grades of fineness can be made on same machine at the same time and in same space; it has less wearing parts than any other; its wearing parts are easily, quickly and cheaply replaced; its wearing parts are adjustable; its adjustments are simple and positive; it requires the lesat attention; the first cost is less than any other of the same capacity; it is not likely to get out of order; it is dustless; it requires no knockers, blowers or brushes to keep cloth open and clean; it requires less cloth for same capacity; its bolted product is more uniform; the separations are perfect; it has no unbalanced weight or motion; its feeding arrangement is simple and durable."

Testimonials are published from a number of cement manufacturers, including the Lawrence Cement company, the Empire Portland Cement company, the Hercules Cement company, the New Jersey Portland Cement company, the Cumberland Hydraulic Cement company and others.

Trade Notes.

The asphalt works at South Amboy, N. J., were destroyed by fire Sept. 30.

The location of a paving brick plant at Steele City, Neb., is said to be contemplated.

The Patton Brick & Tile company, whose plant at Rochelle, Ill., was destroyed by fire recently, will rebuild.

Fire in the warehouse of the Butte Sewer Pipe and Tile company, Butte, Mont., Oct. 12, caused a loss of about $1,000.

The Portland Cement company of Utah, Salt Lake City, has leased land near Bedford, Ind., on which a plant will be erected at a cost of about $125,000.

The Clinton Iron & Steel company, Pittsburg, Pa., is erecting a plant for the manufacture of Portland cement from furnace slag, adjoining their furnace.

The Barber Asphalt Paving company has erected an asphalt plant at Lincoln, Neb., where it secured a contract recently for paving Eleventh-st. with asphalt.

The Baltimore Filter company, Baltimore, Md., has been incorporated by Robert M. Spedden, Robert H. Smith, Joseph E. Henderson, Lucien B. Carpenter and Z. Franklin Potter.

The General Asphalt company, or La Compagnie Des Asphaltes De France, Ltd., has opened an office at 204 Carondelet-st., New Orleans, La. Alfred F. Harley, consulting engineer, is in charge.

The works of the Catskill Shale Brick and Paving company, Catskill, N. Y., have been sold, under a judgment of foreclosure, to Howard P. Ellis for $300,000. The sale will not interfere with the operation of the plant.

A company has been organized at Greenville, Pa., to manufacture paving brick, according to press reports. The plant will be located at Conneaut, O. A. O. Benjamin of Greenville is said to be interested in the project.

A decision has been rendered in favor of F. E. Hetherington of Indianapolis, Ind., who owns the patents for a railway asphalt plant, contention for which has existed in the patent department of the government for more than a year.

A stock company will be formed at Morrice, Mich., by F. E. Purdy, A. L. Beard, B. F. Rann, Sam Crouch and W. J. Richardson to erect a cement factory. An excellent quality of marl and clay suitable for that purpose has been found, it is claimed.

The cement works of the Coldwater Portland Cement company, Coldwater, Mich., are being rapidly erected. The Michigan Portland Cement company secured options on the controlling interest of the Coldwater Cement company a short time ago and it will probably be merged into the larger organization.

The Eastern Paving Brick company has been incorporated in Columbus, O., for mining, quarrying, manufacturing and selling all kinds of brick and tile, sewer pipe and other clay products. The stockholders are R. McLaughlin, O. M. Stafford, P. Johnson, Jotham Potter and A. C. Dustin of Cleveland.

The Portland Cement company of Utah, at Salt Lake City, has replaced the cement plant which was destroyed by fire May 31 with a new one which began operation about Oct. 1. The officers of the company are: President, J. W. Lilienthal; vice-president,

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IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Chicago, Ill.—The cedar block pavements of this city were damaged by the recent rainstorms to the extent of about $250,000.

Buffalo, N. Y.—The recommendations of the finance committee, that paving warrants be drawn and delivered to the contractors, as heretofore, and that the bond exacted from them be increased to 50 per cent. of the contract price, has been adopted. The proposition applies to past as well as all future contracts.

Under "contracts awarded" in the October number of Municipal Engineering it was stated that Massillon brick would be used in the street paving contract at Ligonier, Ind. J. D. Andrews, secretary of the Trimble Brick Mfg. company, Trimble, O., writes that this is a mistake, as that company is shipping Trimble block to be used for that purpose.

Chicago, Ill.—The officers of the Sheridan Road association have beeen assured of the right-of-way for the drive through the village of Lake Bluff. The road is completed to the northern boundary of Lake Forest, which is also the southern limit of Lake Bluff. The drive through Lake Bluff will extend over two miles and will be the most beautiful part of the entire road.

Kansas City, Mo.—An injunction was granted against the Gilsonite Paving company, Oct. 12, restraining it from proceeding with paving Ord-st., from Lexington to Elma, with asphalt, until the grade has been established on the street. Figures compiled by M. E. Getchell, chief clerk in the office of City Engineer Wise, show that the contracts awarded for municipal improvements, consisting of asphalt and brick paving, curbing, grading, sidewalks and sewers, amount to $1,063,334.67.

Peoria, Ill.—Judge Shaw made permanent, Oct. 12, the temporary injunction granted recently in the Dechman asphalt paving contract. The injunction was granted on the ground that the board of local improvements had no right to let the contract for the paving until the assessment roll had been confirmed in the county court. The work will now be delayed until next year, as it will be necessary to advertise for new bids. The contract was awarded to the Assyrian Asphalt company at $1.54 a sq. yd.

New Orleans, La.—As soon as the supreme court has passed upon the new law, City Engineer Bell will have the sidewalks of this city put in good condition. Heretofore there has been no statute by which property-owners could be compelled to repair their sidewalks, bring them up to grade and keep them in order. The city engineer could call upon them to do so, but if they refused there was no punitive clause or law to make them repair them. Owing to some little uncertainty in the new law as to how

Oakland, Md.—The sum of $13,000 will be expended on street improvements.

Redland, Cal.—The city trustees have adopted specifications for asphalt street crossings.

Springfield, O.—Ordinances were passed Oct. 18 for grading and graveling about ten streets.

Oskaloosa, Ia.—The construction of about one and one-half miles of brick paving is contemplated for next year.

Moline, Ill.—An ordinance was passed Oct. 18, providing for the paving of Liberty-st.

Decorah, Ia.—About 1,000 lin. ft. of paving is contemplated for next year. T. F. Acechmoody, cy. clk.

Beardstown, Ill.—The city council decided Oct. 17 to have State-st., from Main-st. to the wagon bridge, paved.

Ottumwa, Ia.—A resolution was passed Oct. 10 to pave S. Green-st., from Main to Semantha. Mayor Phillips.

Leavenworth, Kas.—The question of repaving Delaware and Cherokee-sts. with asphalt is being agitated.

Petersburg, Va.—Sycamore-st. will be paved with brick or asphalt. N. T. Patterson, prest. com. coun.

Urbana, O.—The council contemplates the construction of brick sidewalks on Dugan and Kenton-sts.

Council Bluffs, Ia.—A resolution was passed by the city council, Oct. 10, to pave Fourth-st. with asphalt.

Elgin, Ill.——Brick paving is proposed for National-st., from the river to Villa-st. Alderman Anderson interested.

Sedalia, Mo.—A resolution has been passed to repave Seventh-st., from Ohio to Grand-ave. Jas. P. Quinn, cy. clk.

Middletown, Conn.—The common council passed a resolution Oct. 3 authorizing the macadamizing of Warwick-st.

Boston, Mass.—The board of street commissioners voted Oct. 12 to widen Charlestown-st., from Haymarket-sq. to Causeway-st.

Shippenburg, Pa.—The council is said to be considering the question of issuing $10,000 bonds for street improvements.

Marengo, Ill.—The business men are agitating the question of paving State-st., from Main to the Northwestern tracks.

St. Louis, Mo.—The business men have petitioned for asphalt strips to be laid over the granite pavements of two streets.

Plainfield, N. J.—The estimated cost of paving Park-ave., Somerset-st. and Watchung-ave. with asphalt is $24,395.

Albany, N. Y.—Plans are being prepared for paving Elizabeth, Hamilton, Rose and Dove-sts. in 1899. Horace Andrews, cy engr.

Houston, Tex.—City Engineer Miller has surveyed Main-st., from Buffalo bayou to McKinley-ave., preparatory to repaving with asphalt.

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Janesville, Wis.—An ordinance has been introduced by Alderman Carpenter requiring that sidewalks be built of plank, cement, asphalt or brick.

Washington, Pa.—This borough has voted to increase the bonded indebtedness $60,000 for paving to be done next year. Geo. D. Jenkins, boro engr.

Marinette, Wis.—Paving is contemplated for Riverside-ave. The property-owners on the street are undecided regarding the choice of material for the street.

Beaumont, Tex.—Aldermen Kelly, Ives and Millard have been appointed a committee to secure plans and specifications for different kinds of paving. D. P. Wheat, mayor.

The question of issuing bonds for street paving and improvements will be voted on as follows: Mauchchunk, Pa., $40,000; Baltimore, Md., $1,500,000; Bridgeport, O., $75,000; Monroe, La.; York, Pa., $50,000; Hanover, Pa., $50,000.

Peoria, Ill.—An ordinance was adopted Oct. 4 for the construction of the asphalt paving in Park-ave., from its present terminus to the entrance of Glen Oak park.

St. Joseph, Mo.—A petition has been presented to the mayor and council for asphalt paving on Seventh-st., from Robidoux to Oliver-st., with the exception of one block between Felix and Edmund-st.

St. Louis, Mo.—The council committee on public improvements passed eight street improvement bills Oct. 18. Bills were passed Oct. 11, also, for the reconstruction of streets, with granite blocks, involving an expenditure of $201,000.

Peoria, Ill.—The board of public works directed the city engineer Oct. 17 to submit estimates for brick paving on S. Madison-ave., from Fulton to Franklin-sts., and S. Elizabeth-st., from High to Main.

Baltimore, Md.—Appropriations have been asked for street paving as follows: Asphalt, Gough-st., from Broadway to Patterson Park-ave., $37,000; Pine-st., from Lexington to Saratoga, $2,200; Bush-st., from James to water front, $20,000.

Toledo, O.—The viewers have reported favorably on the proposed stone road to connect Maumee, Waterville and Whitehouse, at a cost of about $80,000, and the question will be considered soon by the county commissioners. The road will be 18 miles long.

Omaha, Neb.—Ordinances were read the second time Oct. 15 for paving with asphalt Twenty-second-st., from Leavenworth to Mason; Twenty-fourth-ave., from Harney-st. to St. Mary's-ave.; Thirty-second-st., from Dodge to Davenport; Fortieth-st., from Farnam to Jackson.

Chicago, Ill.—The property-owners on Halsted-st., between Van Buren and Twenty-third, are undecided as to what material they desire for paving, brick or granite. They have petitioned the board of local improvements to defer the matter a month so that a petition can be circulated.

Anderson, Ind.—The preparation of an block, $32,800, and brick, $36,100; Park-ave., 13,600 sq. yds., Belgian blocks, $23,120, and brick $25,840. Messrs. Ferrebee, Gale and Sterling have been appointed a committee to consider the question of issuing $20,000.

New Britain, Conn.—The paving of Main-st. with asphalt block will probably be deferred until next spring. A doubt exists as to whether the city has the power to compel the adjoining property-owners to pay their proportionate share of the paving and the street committee believes it is better to wait until such power can be obtained from the general assembly rather than run the risk of suit.

Indianapolis, Ind.—Resolutions were adopted Oct. 25 for a brick roadway on Bird-st., from New York to Vermont, and cement walks on Thirtieth-st., from Meridian-st. to Capitol-ave. Engineers' plans were ordered for brick roadways, graveling and cement walks in certain streets and alleys. Final action was taken Oct. 26 for constructing cement walks in certain streets and a petition filed for asphalt or wooden block paving in Arch-st., from Broadway to Park-ave.

Chicago, Ill.—The property-owners on Washington boulevard, between W. Forty-sixth and W. Fifty-second-aves., have petitioned for the paving of that section of the thoroughfare. L. E. McGann, commissioner of public works, completed a list of streets in South Town, and parts of Seventh, Eighth, Ninth and Tenth wards, which, in his opinion, need to be paved or repaved at once. The agitation for the completion of Washington boulevard from its present terminus in the town of Harlem through Melrose park is being revived.

CONTRACTS TO BE LET.

Dell Rapids, S. D.—Bids will be received until Nov. 5 for building sidewalks. D. E. Ward, cy. audt.

Cohoes, N. Y.—Bids are asked until Nov. 9 for grading and paving S. Saratoga-st. Pub. Imp. Com'n.

Lawrenceburg, Ky.—Bids will be received until Nov. 7 for brick paving. J. W. Waterfill, clk. cy. coun.

Toledo, O.—Sealed proposals will be received until Nov. 7 for paving Eastern-ave. with vitrified paving blocks. Lem P. Harris, cy. clk.

Pittsburg, Pa.—Bids are asked until Nov. 3 for improving Freeport, Crooked Run and Street's Run roads in Allegheny county. F. W. Patterson, co. engr.

New York City—Sealed proposals will be received until Nov. 3 for the construction of roads, walks, etc., at Fort Hancock, N. J. G. G. Barley, Capt. A. Q. M. U. S. V., Army Bldg., New York.

Cincinnati, O.—Sealed proposals will be received until Nov. 3 for the construction and repairing of all artificial sidewalks in the eastern and western districts for one year. A. B. Ratterman, prest. bd. cy. affairs.

South Bend, Ind.—Sealed proposals will be received until Nov. 14 for curbing with

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Oshkosh, Wis.—The contract for curbing Thirteenth-st. was awarded to Lutz Bros.

New Haven, Conn.—John A. Doolittle & Co. was awarded the contract for hardening Arch-st. at 28 cts. a sq. yd.

Beloit, Wis.—The contract for brick paving was awarded to A. R. Rutledge & Co. of Rockford, Ill., for $15,000.

Bloomington, Ill.—The Bermudez Asphalt Paving company has been awarded the contract for paving a portion of Center-st.

Akron, O.—The contract for paving Bittman-st., from Maple to Crosby, with brick, has been awarded to P. T. McCourt & Co.

Butte, Mont.—The contract for paving Broadway alley with granite was awarded to E. O. Dugan & Co. at $4.25 a sq. yd.

Philadelphia, Pa.—Richardson & Ross secured the contract, Oct. 17, for 726 sq. yds. of asphalt paving at $1.19 a sq. yd.

Deerfield, N. Y.—The contract for improving 2½ mls. of the River road has been awarded to Jas. J. Dwyer, Utica, for $13,806.

Greencastle, Ind.—A contract for macadamizing, in Warren twp., has been awarded to O'Brien & Co. of Cloverdale, Ind., for $11,500.

Toronto, Ont.—The contract for asphalt paving on Queen and Niagara-sts. has been awarded to the Construction and Paving company for $15,036.

Council Bluffs, Ia.—The contract for 16,000 sq. yds. of brick paving has been awarded to E. A. Wickham & Co. at $1.098 a sq. yd. for Council Bluffs brick.

Salamanca, N. Y.—Shea & McGann, Dunkirk, N. Y., have been awarded the contract for about 9,755 sq. yds. of brick paving in this city for $15,000.

Cincinnati, O.—The contract for paving Delhi-ave., 6,900 sq. yds., with granite, was awarded, Oct. 5, to Wm. Fogarty at $3.35 a sq. yd., or $23,822.

Western Springs, Ill.—The contract for constructing ¾ mls. of 5-ft. cement sidewalk was awarded, Oct. 5, to Spikes & Salfisberg of Aurora, Ill.

Lansingburgh, N. Y.—The contract for constructing about 50,854 sq. yds. of macadam paving has been awarded to Thos. H. Kane, Troy, N. Y., for about $64,000.

Quincy, Ill.—The contract for paving Second-st., from Broadway to Vine, was awarded to Henry Rees at 84 cents a square yard, using Galesburg repressed brick.

Monroe, La.—The Talbot Paving company, Detroit, Mich., has, according to press reports, been awarded the contract for paving Desiard-st., from the river to Sixth-st.

Yardley, Pa.—The Delaware Quarry and Construction company of Lambertville, N. J., was awarded the contract for 7,000 square yards of macadam paving on the main street for $5,475.

Oswego, N. Y.—The board of public works entered into a contract Oct. 17 with the Warren-Scharf Asphalt Paving company to pave the intersection at Bridge and E. First-sts.

Erie, Pa.—The contract for paving Seventeenth-st., from State to Peach, with brick was awarded Oct. 10 to John McCormick & Son at $1.72 a sq. yd. for Mack No. 1 brick.

Detroit, Mich.—The board of public works recommended, Oct. 10, that a contract be entered into with Henry Merdian for Trimble block, for paving Second-st., from Front-st. to Lafayette-ave.

LaCrosse, Wis.—N. C. Bacheller & Co. secured the contracts Oct. 10, for curbing and gutters on several streets at 24 cts. a lin. ft. for gutters and 29 cts. a lin. foot for curbing.

Toledo, O.—The lowest bids received Oct. 10 for paving streets were as follows: Oak-st., brick, H. J. Jameson, $1.47 a sq. yd.; Scott-st., brick, Geo. H. Cole, $1.44; Sixth-st, brick, H. P. Streicher, $1.34.

Auburn, N. Y.—The Warren-Scharf Asphalt Paving company, New York City, has the contract for laying a sample piece of asphalt pavement over Medina stone pavement. The work consists of 1,015 sq. yds. at a cost of $1,750.

Boston, Mass.—Road improvement contracts were awarded Oct. 13 as follows: Road in Merriman, M. Cashman, Newburyport, Mass., $2,474.59; Chelmsford, C. H. Kelleher, Newburyport, $7,172.54; North Reading, C. H. Kelleher, $3,587.28.

Hamilton, O.—The contract for grading and graveling Market-st., from Fourth to Water, was awarded Oct. 18 to W. H. Louthan for $7,558.86. The contract for the main conduit was awarded to Jos. T. Guillaume for $15,745.10.

Cleveland, O.—M. F. Bramley secured the contract for repairing three streets for $15,641 and for the improvement of Ridge road for $6,353, and the Trinidad Asphalt Paving company the contract for asphalt paving on Pearl-st. for $28,108.

Janesville, Wis.—The contract for macadamizing a portion of S. High and Dodge-sts. was awarded Oct. 14 to J. H. Watson at 29¼ cts. per sup. yd. for macadamizing, 11 cts. for furnishing and setting wood curbing and 7 cts. for setting stone curbing.

Syracuse, N. Y.—The Columbia Construction company was awarded the contract Oct. 10 for paving N. Salina and Fulton-sts. with asphalt for $29,014.70. Bids were received for paving McBride-st., from James to Ash., with asphalt and sandstone blocks, but the awarding of the contract was postponed for a week.

St. Paul, Minn.—The board of public works awarded, Oct. 18, the contract for boulevarding Dewey and Feronia-aves., to Fielding & Shepley, for $2,950. John W. Fleetham secured, Oct. 10, the contract for macadamizing certain portions of Rice-st. and the White Bear road, for $16,985.

Kansas City, Mo.—The contract for paving Penn-st., from Sixtieth to Twentieth, which was given to the Parker-Washington company recently, has been rescinded and given to the Barber Asphalt Paving company. The contract involves the laying of about 9,000 sq. yds. of asphalt at a cost of about $12,000.

Rochester, N. Y.—The contract for the Glenwood Park asphalt improvement was awarded to the Rock Asphalt company for $10,037.20; Olean-st., cement walks, E. Q. Oliver, $990; Hebard-st., cement walks, Jacob Mathis & Son, $490; Pierpont-ave., cement walks, Jacob Mathis & Son, $1,660.

Cleveland, O.—Bids were received by the Park Board, Oct. 14, for constructing the main drive through Wade Park as follows: Northern Ohio Paving and Construction company, $28,259; Blanan & Baisch, $29,498; M. I. DeCelle, $29,626; Spence Bros., $30,749; John E. O'Brien, $32,121; Condon & Blasberg, $32,334; William Wachs, $34,957.

Omaha, Neb.—Bids were received, Oct. 7, for asphalt, brick or stone paving, as fol-

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lows: Barber Asphalt Paving company, New York City, $2.05 a sq. yd., 5-yr guaranty; J. B. Smith, Omaha, $1.87, 5-yrs; Hugh Murphy, Omaha, $1.69, 5-yrs; curbing, 69c a lin. ft.; brick, $2.20; Colorado sandstone, $1.80; John Grant Paving company, Omaha, $1.69, 5-yrs.; curbing 70 cts.; P. H. Mahoney, Washington, D. C., curbing, 58 cts.

Indianapolis, Ind.—The Indiana Bermudez Asphalt company was awarded a contract, Oct. 25, for asphalt paving on Fourteenth-st., from Meridian to Illinois, at $2.90 a lin. ft. Contracts were awarded, Oct. 10, as follows: Paving alley, brick, Capital Paving and Construction company, 99 cts.; creosoted wooden blocks, alley, Capital Paving and Construction company, $2.06; creosoted wooden blocks, Ogden-st., Daniel Foley, $4.14.

Logansport, Ind.—Bids were received Oct. 17 for asphalt paving as follows: Bermudez Paving company, Indianapolis, asphalt, $8,384.36; brick gutters, $944.45; combination curb, $871.80. Warren-Scharf Asphalt Paving company, New York City, asphalt, $9,678; brk. gutters, $1,604; c. c., $1,214. Assyrian Asphalt company, Chicago, asphalt, $9,268; brk. gut., $929.22; c. c., $632. Lux & Talbott, Logansport, asphalt, $8,066; brk. gut., $1,016.20; c. c., $800.

Atlantic City, N. J.—The contract for paving Pacific-ave., from Vermont to Albany-aves., was awarded Oct. 3 to the Delaware River Quarry & Construction company of Lambertville, N. J., as follows: Macadam roadway, 62 cts. a sq. yd.; block pavement, $1.75 a sq. yd.; concrete, $4.50 a cu. yd.; straight curbing, 38 cts. a lin. ft.; curved curbing, 5 cts. a lin. ft.; total, $56,963.39. The bid of this company was the lowest of eleven bidders.

New Orleans, La.—Belden & Seely was awarded the contract Oct. 10 for paving Canal-st. with asphalt at $2.10 a sq. yd. and $4.25 a cu. yd. for concrete; paving Canal neutral ground with brick, $2.50; total, $138,-101.25. Bids were received for this work Aug. 8, but were rejected, and new bids asked, which resulted in a saving to the city of $93,812.75. The only bid submitted for the paving of the neutral ground on Canal with bricks was that of Belden & Seely, but it is not probable that it will be accepted.

Louisville, Ky.—Bids were received recently for paving with asphalt Chestnut-st., from Thirty-first to Western Park, E. Broadway, from Highland to Transit and Von Borries and Hepburn-aves. The lowest bid considered was that of the Barber Asphalt company, $22.70 per sq. ft. with a 5-yr. guarantee. The Breckenridge company bid $15 with a 5-yr. guarantee and $17.76 with a 10-yr. guarantee. The board did not consider this bid, owing to its informality, but [illegible] to award the contract to the Atlas brand, nat., $2.74. Bids were received also for furnishing broken stone as follows: Chas. G. Smith & Son, Washington, D. C., coarse broken stone, fine broken stone and granolithic broken stone, $1.32 a cu. yd. each; Washington & Potomac River Iron and Land company, Washington, coarse broken stone, $1.24, fine broken stone, $1.19 and granolithic broken stone, $1.

Lincoln, Neb.—Bids were received Oct. 3 for laying 5,038 sq. yds. of brick or asphalt on streets now paved with cedar blocks, as follows: Barber Asphalt Paving company, New York City, asphalt 2-ins. on 1½-in. binder, 10-yr. guarantee, using 2½-in. concrete above old base, $2; Hugh Murphy, Omaha, for same thickness of binder and wearing surface on 2½-in. broken stone on old base, 5 and 10-yr. guarantee, $1.49 and $1.75 respectively; 2½-ins. concrete on old base and 5 and 10-yrs. guarantee, $1.65 and $1.90; brick on sand filler, 1 and 5-yrs. guarantee, $1.15 and $1.29; with paving cement filler, $1.20 and $1.34; Des Moines Brick Mfg. company, Des Moines, Ia., brick pavements with sand filler and 5-yrs. guarantee, $1.09½ and $1.15; paving cement filler, $1.20 and $1.34.

Chicago, Ill.—Bids were received Oct. 15 for street paving aggregating about $500,-000. The bids show a marked decrease in cost. The Bermudez Asphalt company was the lowest bidder, 10-yr. guarantee, for asphalt paving on the following: Oak-st., $1.65; Schiller-st., $1.69; Turner-ave., $1.67; W. Van Buren, $1.87. Contracts for paving 15 miles of streets, and aggregating $2,000,000, were awarded Oct. 21 as follows: Bermudez Asphalt company, nine asphalt, three granite and one cedar contract; R. F. Conway, three cedar, three asphalt and one macadam contract; Smith, Moss & Brown, two cedar contracts; James Conlon, one macadam contract; Henry Rath, one granite contract; Wm. Corden, one cedar contract; Sackley & Peterson, one macadam contract. All of this paving will be done before Jan. 1. The decision of the courts declaring the city's specifications for brick paving invalid made it necessary to reject bids for that class of paving, but the specifications will be changed and new bids asked.

SEWERS.

Sewers.

Newark, N. J.—The suit brought by the Marcus Sayre company and others for an injunction restraining the board of works from constructing the central relief sewer, according to plans adopted, has been continued until Nov. 25.

Sherman, Tex.—According to local press reports the proposition made by George W.-

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CONTEMPLATED WORK.

Owego, N. Y.—Surveys are being made for the extension of the sewerage system.

St. Cloud, Minn.—The estimated cost of the proposed ravine sewer is $23,000.

Gloucester, N. J.—The construction of a sewer in Ridgway-st. is contemplated.

Grand Junction, Colo.—The construction of a sewerage system is contemplated.

San Francisco, Cal.—Plans have been adopted for a sewerage system in Cortland-ave.

New Haven, Conn.—The council has voted to expend $6,500 for sewers. J. B. Maloney, burgess.

Wolfville, N. S.—The question of sewerage is being considered for this town. Mayor Thomson.

Peoria, Ill.—The board of improvements voted, Oct. 17, to build the proposed sewer in Persimmon-st.

Topeka, Kas.—City Engineer Barnes is preparing to make surveys for the proposed sewer in North Topeka.

St. Paul, Minn.—The construction of a sewer on Cherokee-ave. is proposed, at a cost of $12,910.

Plainfield, N. J.—The construction of a storm sewer in Park-ave. is contemplated at a cost of $2,000.

Washington, Pa.—A number of sewers will be constructed next year. Geo. D. Jenkins, boro engr.

Utica, N. Y.—The construction of a new sewer in Neilson and Mills-sts. is contemplated. Ald. Luker.

Newark, N. J.—An ordinance has been passed to construct a pipe sewer in Jeliff-ave. Jas. M. Seymour, mayor.

Lincoln, Ill.—An ordinance was passed Oct. 10 for a sewer on College-ave., from Peoria to Keokuk-sts.

Chattanooga, Tenn.—The improvement of the Washington-st. sewer is contemplated, at a cost of about $10,000.

Webster, Mass.—The extension of the sewerage system, at a cost of about $20,000, is contemplated for next year.

St. Joseph, Mo.—The construction of 15-12-in. pipe sewers in two streets is contemplated. C. S. Sheperd, cy. clk.

New York City.—The local board of improvements, Borough of Bronx, has approved resolutions for sewers in several streets.

Sioux Falls, S. D—.The South Side Sewerage company has been incorporated by Park Davis, Adrian L. Peck and C. O. Bailey.

Galesburg, Ill.—City Attorney Boutelle advises special assessment as a means of paying for the proposed trunk sewer.

Davenport, Ia.—The construction of an intercepting sewer, at a cost of $150,000, is contemplated. Albert J. Smith, cy. clk.

East Hartford, Conn.—The construction of sewers, at a cost of about $35,000, is contemplated. Jos. O. Goodwin, town clk.

Marquette, Mich.—E. E. McIntosh, cy. engr., has been instructed to prepare plans and specifications for an 8-in. tile sewer.

Helena, Mont.—A resolution has been passed creating special improvement, district No. 6. Edward Horsky, cy. clk.

Carrollton, Mo.—Alex. Trotter, Thos. B. Goodson and Herman Davids are on the committee interested in the proposed sewerage system and paving. Wm. Riblett, cy. clk.

Napoleon, O.—The state board of health has approved, conditionally, a plan for sewage disposal for this city.

Buffalo, N. Y.—The sewer committee adopted a report Oct. 17 ordering a notice of intention for a new sewer in Emslie-st.

Syracuse, N. Y.—Bids will probably be asked soon for the construction of a trunk sewer in the First ward, at a cost of about $60,000.

New Hampton, Ia.—The construction of a sewer on Chestnut-ave., from Main to Hale-st., 990 ft., is contemplated. G. A. Hamilton, clk.

Grand Rapids, Mich.—The board of public works will readvertise for proposals for building the Myrtle and Turner-sts. sewer.

Binghamton, N. Y.—A resolution was passed by the council to construct a sewer on Clinton-st., between Front and Murray.

Macon, Mo.—The question of constructing a sewerage system is being considered. Col. Blees has donated $5,000 toward the improvement.

Springfield, O.—Dr. John Rodgers, H. H. Seys and Dr. A. H. Vance compose a committee to investigate the feasibility of erecting a sewage farm.

Kentville, N. C.—The board of trade is urging the town council to decide upon some plan of learning what the cost would be for sewering the town.

Yazoo City, Miss.—L. G. Montgomery, chrmn., desires to correspond with reliable parties regarding the proposed construction of a sewerage system.

Haverhill, Mass.—Plans are being considered for a trunk sewer or sewage disposal beds for the new Hale hospital buildings, but no action has beeen taken.

Lake Linden, Mich.—The council has authorized President Heidkamp to secure the services of an engineer to furnish estimates of the cost of a complete sewerage system.

Monroe, La.—An election will be held Nov. 9 to vote bonds for the purpose of employing engineers to furnish plans for sewerage and water works systems, paving, etc.

Madison, Mo.—The question of issuing $50,000 in bonds for a sewerage system for the village is, according to press reports, being considered by the village board.

Winston, N. C.—The construction of a sewerage and water works system is said to be contemplated by certain northern parties interested in the proposed manufacturing plants to be built here.

Warren, Pa.—The subscription of $4,000 by four citizens, together with the $10,000 appropriated by the state, will be sufficient, it is thought, to begin building the sewage disposal plant.

Chambersburg, Pa.—A proposition of Chauncey Ives, C. E., of this city, relative to making a survey, maps and plans for a sewerage system has been referred to the street committee with power to act.

Rogers Park, Ill.—An ordinance was introduced by Alderman Hirsch Oct. 24 authorizing the extension of the north side intercepting sewer from Pratt-ave. to Bryan-ave., for the purpose of diverting the flow of all sewers along the north shore emptying into the lake. Bids will be advertised soon.

Youngstown, O.—City Engineer Lillie submitted a plan Oct. 17 for improving the sewerage system. His plan is to take the surface water from the region near Spring-

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st. to Crab creek, and three methods are provided for doing this, the cheapest one involving an expenditure of between $4,000 and $5,000.

The question of issuing bonds for the construction of sewers and sewerage systems will be voted on as follows: Norfolk, Va., $105,000, Nov. 8; Independence, Mo., Nov. 1; Omaha, Neb., $50,000, Nov.; Baltimore, Md., $2,000,000 in November; Wellsville, O., $75,000, Nov.; Grass Valley, Cal., $40,000, Nov. 8; Dalton, Ga., Nov. 2.

South Orange, N. J. — Alexander Potter, C. E., of New York City, has submitted a report of a preliminary survey and the estimated cost of the proposed trunk sewer, to connect Newark, Irvington, Vailsburg, Millburn, West Orange and South Orange with tidewater. Mr. Potter advises that the outlet be at Bay Way, in Elizabeth, emptying into Staten Island sound. He estimates the cost, including survey, construction and right-of-way, at $109,000. The joint committee has directed him to make a survey and estimate of cost to each city and village of two little trunk sewers, one through Vailsburg and Irvington, and the other from West Orange through South Orange

Toronto, Ont.—City Engineer Rust submitted a report to the mayor, Oct. 17, upon the disposal of sewage. He recommends the adoption of the system of intercepting sewers, as recommended by Messrs. Hering and Gray, with some slight modifications, but believes that it would be advisable for the council, before incurring such a heavy expenditure, to obtain the opinion of a consulting engineer. Mr. Rust's estimate of the cost of the systems is favorable to intermittent filtration. His estimates are: Intermittent filtration, total cost, $1,730,000; cost of maintenance, $70,000. Precipitation works. total cost, $1,540,000; annual cost of maintenance, $105,000.

CONTRACTS TO BE LET.

Albany, N. Y.—Bids are asked until Nov. 7 for constructing a pipe sewer in Quail-st. Thos. J. Lanahan, clk. bd.

Keokuk, Ia.—Bids will be received until Nov. 3 for constructing 474 ft. of 6-in. sewer. W. I. Johnston, cy. clk.

South Bend, Ind.—Sealed proposals will be received until Nov. 14 for building a brick and pipe sewer. L. A. Hull, cy. clk.

Cleveland, O.—Sealed proposals will be received until Nov. 9 for the Berea road masonry, grading, draining, etc. Julius C. Dorn, clk. bd. co. comrs.

East Cleveland, O.—Sealed proposals will be received until Nov. 5 for constructing sewers and their appurtenances in sundry streets and avenues. H. B. Chapman, vil. clk.

CONTRACTS AWARDED.

Oshkosh, Wis.—The contract for building a sewer in Bowen-st. was awarded to John Rasmussen & Co.

Marietta, O.—The contract for constructing a sewer in the Fifth district was awarded Oct. 18 to Z. T. Darrow.

Syracuse, N. Y.—E. G. Gay & Co. was awarded the contract for pipe sewers in several streets for $5,572.

Sycamore, Ill.—The contract for the construction of a sewer was awarded Oct. 11 to P. J. McNulty of Chicago for $3,558.22.

Rochester, N. Y.—The contract for building the N. Clinton-st. sewer was awarded Oct. 4 to H. N. Cowles of $6,867.25.

Stockton, N. J.—B. F. Sweeten & Son, Camden, N. J., secured the contract Oct. 11 for a new sewerage system in this town.

Buffalo, N. Y.—John Harrer secured the contract, Oct. 14, for building a new sewer in Hampshire and Ferry-sts. for $34,800.

Hamilton, O.—The contract for constructing a sewer in Fourth-st. was awarded Oct. 18 to W. H. Louthan for $1,198.99.

Indian Orchard, Mass.—The contract for building a sewer has been awarded to R. D. Maynard of Springfield, Mass., for $2,397.

Concord, Mass.—The contract for the sewerage filtration beds has been awarded to J. W. Meskill, Everett, Mass., for $1,473.

Faribault, Minn.—The contract for constructing the East Side sewer was awarded Oct. 7 to O'Neil & Son, city, for $10,000.

Boston, Mass.—F. E. McCarthy was awarded a contract Oct. 7 for building sewers and drains in Richmond and Adams-sts. for $9,722.

Monmouth, Ill.—Brodin & Dungan secured the contract Oct. 14 for sewers as follows: W. Fourth-ave., $623; S. Fourth-st., $1,047.15.

Butte, Mont.—H. M. Stanchfield secured the contract for building a sewer in Park alley, from Oklahoma to Gaylord, for $2,932.

Columbus, O.—Bids were received Oct. 18 for building sewers in Spruce, George and Charles-sts., the lowest being that of I. O. Jones.

Greenville, Pa.—The contract for constructing the new East ward sewer has been awarded to J. Will Mitchell of New Castle for $2,365.50.

Galesburg, Ill.—The contract for constructing sewers on Beecher-ave. and Losey and Pearl-sts. was awarded Oct. 6 to Jas. O'Connor.

Burlington, Ia.—The contract for the foundations of the outfall of Valley-st. sewer was awarded Oct. 17 to N. S. Young, city, for $12,400.

Beloit, Wis.—The contract for building a section of sewerage on the West Side was awarded Oct. 11 to Richard F. Finley of Janesville, Wis.

New Haven, Conn.—John A. Doolittle & Co. secured the contract for a sewer in Sherman-ave., between Goffe and Henry-sts., for $6,176.50.

Evansville, Ind.—Michael Weber secured the contract Oct. 15 for building the main sewer in Washington-ave., from Garvin-st. to Linwood-ave., at 41 cts. a ft.

Madison, Wis.—The Reichart Construction company, Racine, Wis., was awarded the contract for constructing sewers in Lexington-st. at $5,650 and Lake-st. at $3,400.

Joliet, Ill.—The contract for constructing a sewer and connections in Division-st. was awarded Oct. 14 to Campbell & Dennis; Union-st. and Fourth-ave., John Fleming.

Albany, N. Y.—John Doyle was awarded a contract Oct. 17 for constructing a sewer in Third-st. for $3,137.30, and Michael Dollard a sewer in Second-st. for $2,016.16.

Cohoes, N. Y.—Bids were received Oct. 12 for building sewers in sec. 1, and, according to press reports, the contract was awarded to F. S. Aplett, Cohoes, for $29,734.35.

Somerville, Mass.—Contracts have been awarded for constructing about 2,000 ft. of 26x39-in. brick sewer, as follows: Section 1, F. F. Crimmings, $2,690; section 2, E. E. Trumbull & Co., $8,081.

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Mobile, Ala.—The contract for the sewerage system was awarded Oct. 19 to T. J. Shea of Quincy, Ill., for $123,272.50. This bid was $7,000 less than the highest bid received, which was $130,500.

Moline, Ill.—The contract for macadamizing, curbing, drains, sewers and water mains on Twenty-fifth-st., in Reed & Ryder's addition, was awarded Oct. 7 to the Davis company for $13,000.

Quincy, Ill.—Sewer contracts were awarded Oct. 17 as follows: Kentucky-ave., E. Best Plumbing company, $629; Seventh-st. $1,317, Third-st. $2,405, Third-st. $1,810 and Ohio and Twelfth-sts., $1,329, Peter Simons.

Allegheny, Pa.—Sewer contracts in the Tenth ward were awarded Oct. 7 as follows: McKee-st. $1.058 Hall-st. $1,500, Watson boulevard $1,522, Sweeney & Houston; Osgood-st., Thos. Prosser, $483; Pennsylvania-ave., Sicilian Asphalt Paving company, $9,618.

Bellevue, Ia.—The contract for constructing the sewer was awarded Oct. 7 to M. Tschirgi, Jr., of Dubuque, at the following prices: Main sewer, 50 cts. per lin. ft.; catchbasin connections, 40 cts. per ft.; manholes, $20 each; catchbasins, $11.

Indianapolis, Ind.—The contract for building a main sewer in Michigan-st., from White river to Holman-ave., was awarded Oct. 19 to Gus Kothe at $4.07 a lin. ft. Local sewers were awarded to H. C. Roney at 55 cts. and W. C. Allen at $1.21.

Milwaukee, Wis.—Sewer contracts were awarded Oct. 12 as follows: Ziemer-st., 1,298 ft. brick and pipe, G. E. Zimmerman, $1.33 a lin. ft.; Grant-st., 658-ft. pipe, M. Chybowski, 99½ cts.; Newhall-st., 651-ft. pipe, Dan O'Driscoll, $1.12 a lin. ft.

Brooklyn, N. Y.—Bids were received Oct. 19 for the construction of a temporary private sewer in Eighteenth-ave., between Fifty-seventh and Seventh-fifth-sts., for the Disciplinary Training School for Boys, from fifteen contractors. The contract has not been awarded.

East Cleveland, O.—Bids were received Oct. 10 for constructing sewers in a number of streets and for a sewage disposal plant as follows: Sewage disposal plant—Herbert Tate, New York, $21,787; D. A. Tompkins company, Charlotte, N. C., $20,670. Sewers—Cleveland Contracting company, $11,515 and $9,609 respectivesy for sections 3 and 4; R. J. Clements, $14,309, $14,204; R. H. Gray, $13,134, $11,222; Wm. McDowell, $15,169, $11,984; The Northern Ohio Paving & Construction company, $15,997, $13,197; Ford P. Beers $14,178, $11,423; R. B. Burnett, $23,183, $17,884; Clements Construction company, informal, $13,188. The contractors bidding on the sewers are all of Cleveland.

WATER-WORKS.

Alliance, O.—The council will purchase the water works plant for $198,000.

Appleton, Wis.—Judge Seaman appointed Herman Erb receiver of the Appleton Water works company Oct. 24. Default on the interest of bonds led to the action.

Superior, Wis.—The council voted, Oct. 4, to commence suit to annul the franchise of the Superior Water, Light & Power company, because of its failure to comply with the terms and conditions of the contract.

Baltimore, Md.—The state board of health has decided to institute criminal proceedings against all persons who permit the existence on their property of conditions inimical to the purity of the city water supply.

Santa Cruz, Cal.—The Holland Trust company, New York City, brought suit Oct. 14 in the United States court against the city of Santa Cruz and the Santa Cruz water works to foreclose a mortgage on a trust deed of water bonds to the amount of $103,000 with $30,900 interest.

Jersey City, N. J.—The United States government completed, Oct. 19, the construction of the new pipe line which is to supply Ellis Island with Pequannock water, secured from Jersey City mains. The government will pay this city $100 for every million gallons of water supplied to Ellis Island.

Brooklyn, N. Y.—Commissioner Dalton has outlined the improvements which he contemplates making if he is allowed the $1,500,000 appropriation he has asked for. His plans involve the following: Four 66-inch steel conduits from Spring Creek east to Milburn, $960,000; for improvements and increase to Milburn Pumping Station and plant, $100,000; for laying additional mains in city, $150,000; for lands to increase well pumping plants and to protect present source of supply from contamination, $150,000; for additional machinery, wells, engine houses, etc., at well pumping plants, $150,000; total, $1,500,000.

CONTEMPLATED WORK.

Bridgeton, Me.—The council is planning for a new water supply.

Bay City, Mich.—The water board contemplates extending the water mains next year.

Frenchtown, N. J.—The question of securing a water supply is under consideration.

Hinton, W. Va.—The Hinton W. W. company desires estimates for a 1,000,000 gal. filter.

Detroit, Mich.—A new system of intake pipes is proposed, at a cost of from $40,000 to $120,000.

Norristown, Pa.—The town council contemplates the establishment of a municipal water plant.

Millvale, Pa.—The question of issuing $5,000 bonds for a new pump will be voted on in November.

McConnellsville, O.—An ordinance was passed, Oct. 17, for constructing a water works system. Mayor Weber.

Taunton, Mass.—An appropriation of $15,000 for boilers, etc., at the pumping station is reported.

Sherman, Tex.—An ordinance has been passed authorizing the issuance of bonds for water works and electric lights.

Sidney, N Y.—The Sidney Camp Grove association has decided to build water works and a light plant for its grounds.

Brazil, Ind.—This city will probably go to the Wabash river, a distance of 12 mis., for its water supply.

Jones, Mich.—(Special)—George V. Deal says this village has voted to put in a water and electric light system.

Pasadena, Cal.—An engineer will be employed to consult with City Engineer Clapp regarding a water works system.

St. Louis, Mo.—An ordinance has been passed providing for the erection of two additional pumping engines at the Baden pumping station. M. L. Holman, water comr.

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Urbana, O.—The city council appropriated, Oct. 10, the sum of $300 to pay for the cost of preparing plans for a new water works system.

Columbus, O.—The board of public works, for the second time, rejected all bids for the proposed new storage dam, and will advertise again.

Little Falls, Minn.—This city has voted $60,000 bonds to purchase the present water works and electric light plant or build a new one.

Lancaster, Pa.—The report and plans for a 10,000,000-gal. filtration plant will be completed soon, according to press reports E. H. Frailey, supt.

Holyoke, Mass.—The board of water commissioners is considering plans for installing a filtration plant at an estimated cost of $50,000.

Barrie, Ont.—The question of issuing $100,000 bonds for the purchase of the water works plant and extension of the system will be voted on Nov. 14.

Bennett, Pa.—The question of issuing $25,000 bonds for additional machinery for the water works and electric light plant will be voted on Nov. 8.

Grand Rapids, Mich.—The committee has been authorized to engage an engineer to recommend the best method for increasing the capacity of the pumping station.

Salt Lake City, Utah—The council has appropriated $2,500 to pay for surveys for an additional water supply. Councilmen Robertson, Callister and Morris.

Reading, Pa.—An ordinance has been passed to call an election to vote on the question of a loan of $225,000 to erect a land filtration plant for the water supply.

West Springfield, Mass.—The water commissioners are reported as having decided to issue bonds to secure plans for an improved water works system. W. T. Smith, chrmn.

Washington, Ga.—The city council will issue bonds, according to press reports, to purchase the water works and electric light plant and to build a new sewerage system.

The question of issuing bonds for water works construction will be voted on as follows: Independence, Mo., San Pedro, Cal.; Cuyahoga Falls, O., Nov. 8; Lake Providence, La.

Charlotte, N. Y.—Press reports state that the citizens of this place have asked that another election be held to vote on the question of issuing bonds for a water works and electric light plant.

Charleston, S. C.—Messrs. Rhett, Lapham and Williams have been appointed a special committtee to ascertain the practicability of procuring a water supply of not less than 7,000,000 gals. a day.

Newark, N. J.—The board of works has authorized the sinking of as many additional wells as are necessary to meet all demands upon the city's water supply until the Pequannock plant becomes the property of the city in 1900.

The question of water works has been at $33,000 and the running expenses and repairs of the plant at not more than $500 a year.

Lawrence, Mass.—The Massachusetts state board of health has recommended that the filter bed connected with the water works be covered to prevent the formation of ice on the bed and insure the proper working of the filter and the ability to clean it in winter.

Jamaica, L. I.—The Jamaica Water Supply company has issued $400,000 of 5 per cent. bonds, $250,000 of which will be used in retiring outstanding bonds and the remainder in the building of the proposed extension of mains to Queens and Hollis, etc.

The construction of water works systems is contemplated at the following places; Tullahoma, Tenn.; Tucson, Ariz.; Oakesdale, Wash.; Zumbro Falls, Minn.; Adair, Ia.; Woodlawn, Ala.; Harper's Ferry, W. Va.; Fresno, Cal.; Essex Junction, Vt.; Logan, W. Va.; Camden, S. C.; Sturgis, Ky.; Palmer Lake, Col.

CONTRACTS TO BE LET.

St. Paul, Minn.—Bids are asked until Nov. 7 for two tubular boilers for the Como Park pumping station. Matt Jensen, cy. clk.

Wynne, Ark.—Sealed bids will be received until Nov. 8, postponed from Oct. 15, for constructing a water works system. Wm. M. Kennedy, chrmn. bd. imp't dist.

Rock Hill, S. C.—Sealed proposals will be received until Nov. 15 for the construction and completion of certain additions to the existing water works. Frank Oleson, Secy. B. P. W.

Honolulu, Hawaiian Islands.—Sealed tenders will be received until Nov. 25 for cast iron pipe and connections. Jas. A. King, Minister of the Interior. Specifications can be obtained at the Hawaiian Consulate, 65 Wall-st., New York City.

CONTRACTS AWARDED.

Milledgeville, Ill.—The contract for water works has been awarded to J. L. White of Leonore, Ill., for $8,000.

Harrisville, N. Y.—The contract for construction of the w. w. was awarded to W. C. Seigrist of Utica for $6,752.

McLeansboro, Ill.—The contract for constructing the water works was awarded to Chas. A. Stookey of Belleville for $10,000.

Charlotte, N. Y.—The contract for building w. w. was awarded, Oct. 15, to M. B. Birdseye and R. B. Lewis, Fayetteville, N. Y., for $24,600.

Fitzgerald, Ga.—The contract for building a water works and electric light plant has been let to Moore & McRae of Atlanta.

Pueblo, Col.—The contract for constructing a 34-in. wooden supply pipe from the reservoirs to the pumping station was awarded to Richard Holmes and W. F. Allen of Denver at $1.25 a lin. ft.

BRIDGES.

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Valencia, Kas.—The erection of an iron or steel bridge over the Kansas river is proposed.

Williamsport, N. D.—The erection of a steel bridge across Long Lake creek is contemplated.

Arcadia, Wis.—The erection of a steel bridge across the river is contemplated by the village board.

Independence, Mo.—The new bridge, which was recently built at Atherton at great expense, collapsed recently.

Lexington, Neb.—Bids are asked until Nov. 2 for building new bridges and repairing old ones. W. C. May, co. clk.

Livermore, Ia.—The erection of an iron bridge to replace the La Compte bridge is contemplated by the county board.

Olivet, S. D.—Bids will be received until Nov 11 for constructing two steel bridges. J. S. Mueller, co. audt.

Lexington, Mo.—Frank Bowman, secy., desires to correspond with bridge contractors regarding the construction of a wagon bridge.

Easthaven, Conn.—The construction of a drawbridge over the dike is contemplated, at an estimated cost of $10,000.

Wilkesboro, N. C.—Bids are asked until Nov. 7 for a bridge at Curtisford, Yadkin river, and for several smaller bridges.

Oakland, Cal.—Bids will be received until Nov. 7 for constructing the Webster-st. bridge over San Antonio Estuary. Frank C. Jordan, co. clk.

San Jose, Cal.—Bids will be received until Nov. 9 for constructing a bridge over Isabell creek on the Kincaid road. Co. supervisors.

Richmond, Ind.—The county commissioners are reported as having under consideration the erection of a bridge across the Whitewater river.

Pekin, Ill.—The Wrought Iron Bridge company, Canton, O., has been awarded the contract for building a bridge over the Mackinaw river for $4,200.

Norfolk, Va.—A resolution has been passed authorizing the board of street, sewer and drain comrs. to contract for a bridge over Smith's creek.

Norwich, N. Y.—Bids will be asked soon for designs and the construction of an iron bridge over the Canasawacta creek at W. Main-st. Highway, Com'n.

Dobson, N. C.—The construction of an iron bridge across Fish river, to replace the one destroyed by fire, is contemplated by the Surry co. bd.

Houston, Tex.—Sealed proposals will be received until Nov. 14 for the construction of a steel bridge over Buffalo bayou at the foot of Franklin-ave. I. A. Mullen, cy. engr.

Newark, N. J.—A resolution has been adopted by the freeholders to ask bids for a bridge, with stone abutments, brick arches and steel beams, across the Rahway river in South Orange twp.

Quebec, Que., Canada.—Sealed proposals will be received until Jan. 2, 1899, for the construction of a combined railway and highway bridge across the St. Lawrence river; Ulric Barthe, secy., Quebec Bridge company, ltd.

Cleveland, O.—Sealed proposals will be received until Nov. 5 for constructing the masonry substructure, foundations, etc., and reconstructing and rebuilding Center-st. bridge over the Cuyahoga river. Geo. R. Warden, dir. pub. wks.

Muskegon, Mich.—A committee has been appointed to decide on a location for a new wagon bridge to be built across the river near the Trading Post grounds. Supervisors C. S. Place and Wm. Matthews, members of com.

Cincinnati, O.—Sealed proposals will be received until Nov. 7 for the construction of the superstructure of a street railroad viaduct across the valley of Lick Run, east of the Little Miami river. Chas. G. Roth, clk. bd. of trus., comrs. of w. w.

Chicago, Ill.—Sealed proposals will be received until Nov. 30 for the removal of the Moline wagon bridge across Rock river and for the design and construction of a high bridge in its place. W. L. Marshall, maj. engrs., 1637 Indiana-ave. Sealed proposals will be received until Dec. 7 for substructure, superstructure and auxiliary work for the change of the Van Buren-st. approach span across the by-pass along the Chicago river. Jas. Reddick, clk. bd. trus. Sanitary dist.

GARBAGE DISPOSAL AND STREET CLEANING.

Newton, Kas.—The construction of a garbage crematory is contemplated.

Gainesville, Tex.—The garbage crematory destroyed by fire Oct. 5 will be rebuilt by the council.

Oakland, Cal.—J. W. Northup has applied for a 50-year franchise to collect and cremate garbage.

Newton, Mass.—The question of building a garbage disposal plant is under consideration.

Bridgeport, Conn.—The contract for a garbage disposal plant will be let in a few weeks.

Mansfield, O.—The question of better methods for the disposal of garbage is being considered by the council.

Louisville, Ky.—The erection of an incinerating plant for the consumption of garbage is contemplated.

Hot Springs, S. D.—The City Garbage company has been incorporated by Alex McDonald of Omaha and Chas. L. Fargo of this city.

Mitchell, S. D.—Councilman Edwards and the board of health have been authorized to investigate the subject of a garbage crematory.

New Orleans, La.—Plans and estimates have been prepared by the city engineer for two additional garbage incinerators.

Atlanta, Ga.—The erection of two central crematories is recommended by the board of health. Lewis H. Jones, chrmn. com.

Norristown, Pa.—A proposition has been submitted to the board of health by J. L. Lemish of Phila. to receive and dispose of the garbage of this city.

Atlantic City, N. J.—The contract for a new crematory has been awarded to M. V. Smith of Phila. for $27,500, according to press reports.

Reading, Pa.—The contract for a garbage crematory has been awarded to the General American Reduction company of New York City.

(Continued on page 29.)

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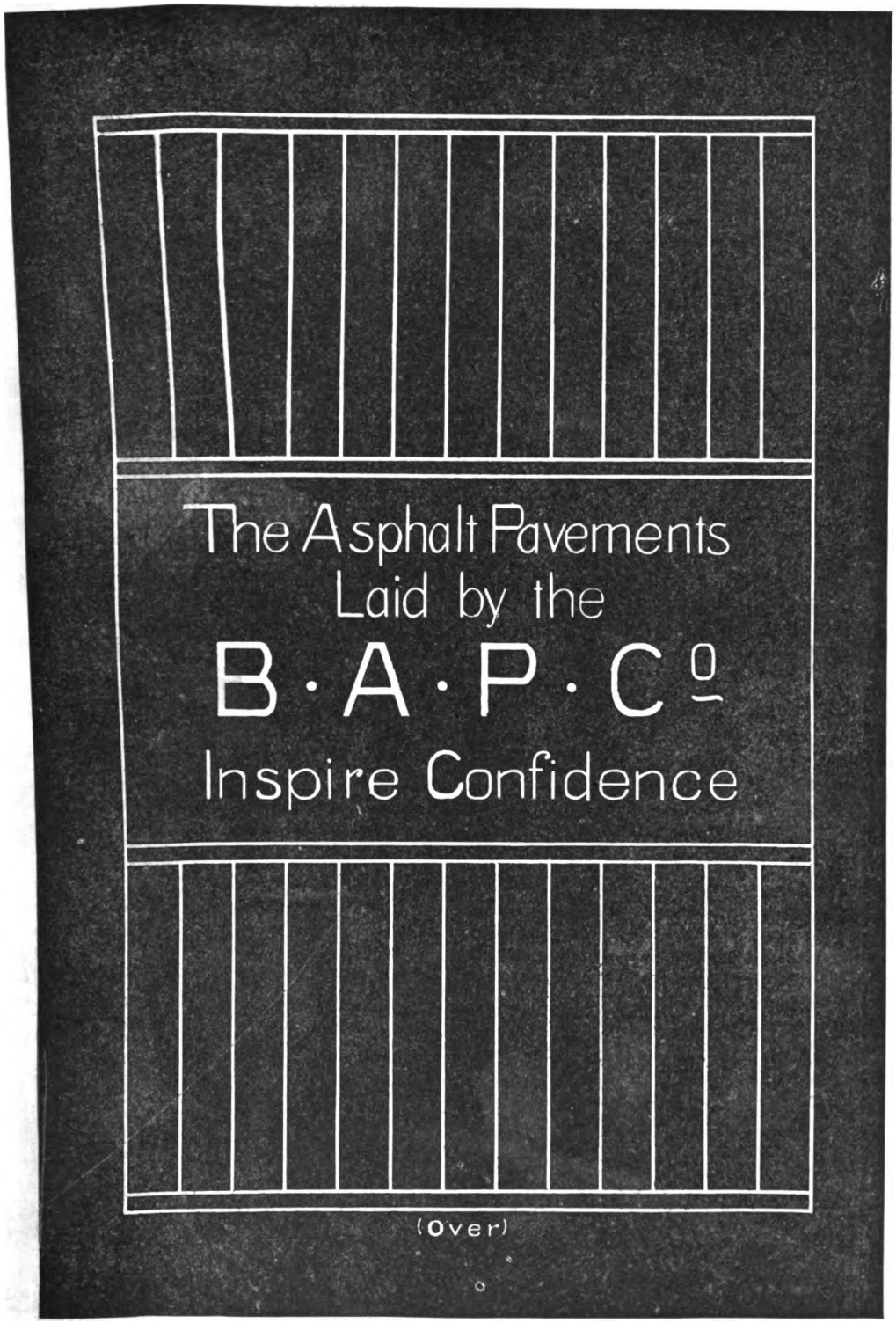

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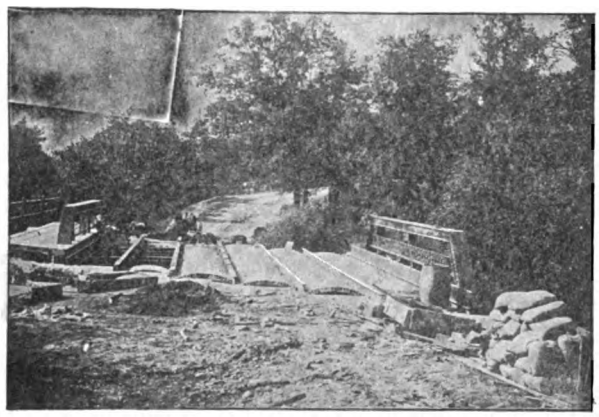

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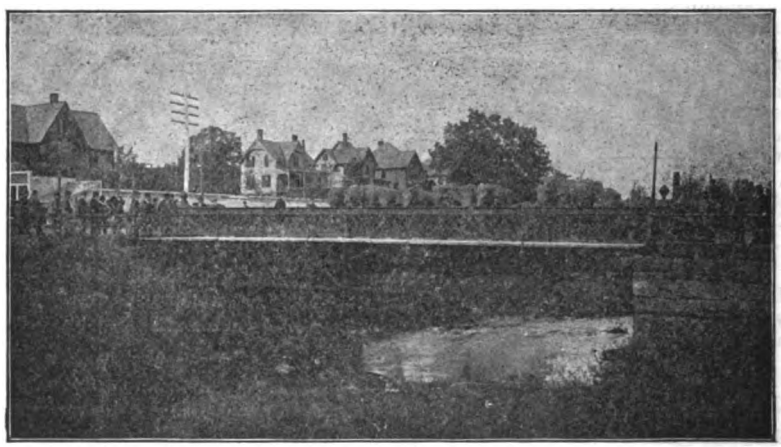

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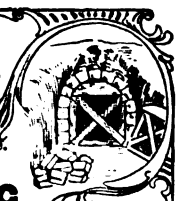

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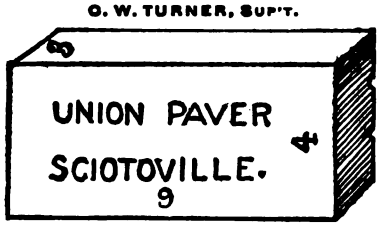

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Municipal Engineering

VOLUME XV. DECEMBER, EIGHTEEN NINETY-EIGHT. NUMBER 6.

TOWN WATER-WORKS FROM A FINANCIAL STANDPOINT.

By W. L. Hedenberg.

It is surprising in these days of progress to note the opposition frequently met with when the subject of introducing a water supply into a small community is first broached. Every possible excuse will be brought forward as an argument against the proposed innovation, and if the question be put to popular vote, as is frequently done, it stands an almost certain chance of being defeated by the less enlightened portion of the population.

This condition of affairs is brought about to a great extent through ignorance, conservatism and a fear of increase in tax. Although the importance of having a pure and abundant water supply always ready at hand has only been fully appreciated in this country since the beginning of the present century, as prior to that period water for domestic use was usually obtained from rivers, wells or springs, the ancients realized the immense value of this commodity to the well-being of a community, as testified in the still extant ruins of either aqueducts or water-work systems at such places as Jerusalem, Pompeii and Rome.

The works at Rome especially were most extensive. During the life of the Emperor Claudius, about A. D. 52, Rome was being supplied by as many as nine different acqueducts, ranging in length from ten to sixty miles. There were over one thousand three hundred fountains for public use and eleven thermæ or public baths. Some idea may be gathered of the large quantity of water supplied to imperial Rome when it is stated that the amount consumed averaged 300 gallons per individual daily or about three times the number of gallons allowed per capita in New York city.

The advantages from a sanitary standpoint of an abundant and wholesome water supply are at the present day so obvious that lengthy arguments in its favor would seem a waste of both time and space. However, for the benefit of a large number of persons, to be found in every small community, who strenuously object to the introduction of a water-works system, on the ground that it entails a heavy expense, with no pecuniary return, it might be in place to refer to an investigation made by Professor Mason of the Rensselaer Polytechnic Institute, with a view to determining the value of wholesome water in dollars and cents, as embodied in his admirable work, entitled "Water Supply." Referring to typhoid fever and to the possibility of reducing the death rate from this disease by the use of pure water, he seeks to determine whether the outlay in money for suitable

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works is justified by the saving in human life, looked at solely from a pecuniary standpoint. Assuming the value of a human life to be worth $2,000, and with this figure as a basis, he examined the case of Albany, N. Y. With an average of seventy-five deaths due to typhoid fever a year, as given in the annual report of the State Board of Health at the time of the investigation, the pecuniary loss due to death alone would amount to $150-000 annually. Estimating funeral expenses at $25 each, the total direct loss through death would be $151,875. Prof. Mason goes on to state, however, that typhoid does not always kill, and where one dies statistics go to show that nine usually recover. Allowing forty-three days as the period of convalescence, this would mean 29,025 days as representing time lost per year for the 675 persons who recover. With wages at $1 per day, there would be a total yearly loss of $29,025, which added to the cost of nursing, physicians' bills, etc., would bring the total amount up to $197,775 as a "tax levied annually by typhoid fever upon the city of Albany." The above would certainly seem to emphasize the need of communities providing themselves with suitable water-works, and abandoning wells, which become in time necessarily more or less polluted.

As soon as a town contemplates doing away with the "old oaken bucket," the momentous question immediately arises as to whether it is more advisable to grant a franchise to an outside company to build and operate a system or to construct and run it as a municipal plant. In the opinion of the writer, and generally speaking, it is advisable for a town to own its own works if possible, for it is surprising to note how many private water companies are involved in litigation with the municipalities in which they are located. A canvass was recently made by the publishers of the Manual of American Water-Works to ascertain what the exact number was. Out of 377 companies located in various towns and small cities throughout this country, 124, or over 32 per cent., were involved in disputes with the municipalities in which they were situated. The cause of these disputes apparently arose in the majority of cases through misunderstandings in regard to hydrant rental, etc.

From this it will be seen that it behooves a town when about to grant a franchise for a system of water-works, or for any other franchise for that matter, to examine very carefully into the problem, obtain the best legal advice and eliminate as much as possible all vagueness and ambiguousness. It is usually owing to the last named causes that future trouble is apt to arise. Right here it might be stated that the price at which a plant can be duplicated in after years is not usually a fair basis of valuation, as is sometimes supposed, in the event of a town's desiring to purchase the works. Other elements should be taken into consideration, as, for instance, the difference in the market price of material and labor at the time the plant was built and at the time of the negotiations looking toward its purchase, the amount of business the company is doing and its yearly net receipts. No one could reasonably expect to purchase a good paying business established for twenty or thirty years for the same sum of money the owner had originally invested. The good will and custom is unquestionably worth something. This feature is frequently over-

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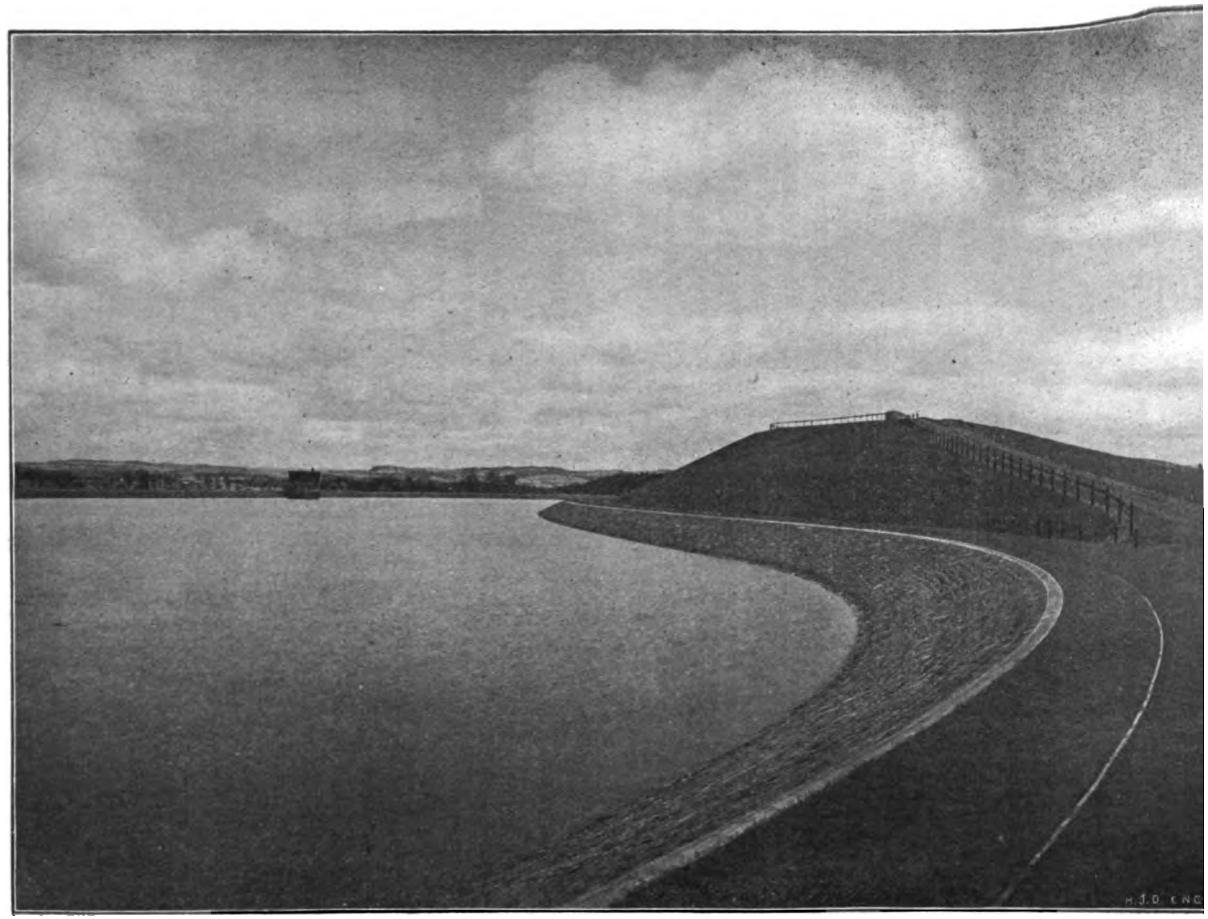

A VIEW OF THE WOODLAND RESERVOIR OF THE SYRACUSE, N. Y., WATER-WORKS.

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looked or ignored by many communities.

It is difficult to make the average town councilman see why, if the water-works plant originally cost, say $25,000, now after years of use entailing necessarily more or less deterioration, the town should be asked $35,000 for it. This question as to what a plant in a given town will be worth at the end of, say twenty years, is impossible to determine in advance. If in excellent condition at the end of this period, and doing a good business, it will probably be worth several times what it originally cost. If, on the other hand, a large amount of piping and machinery needs to be renewed, or the quality of the water has deteriorated, necessitating the finding of a better and larger source of supply, the value of the plant will be less than it originally cost.

No matter how carefully, therefore, a water-works franchise is worded, there is always apt to be disagreement and litigation when the town decides to own the works. It is better and cheaper in the long run, in the opinion of the writer, for a community to build and operate its own works, providing—and here is usually to be found the stumbling-block—every change of local administration does not likewise entail a change in the management of the plant. In short, the granting of a water-works franchise is somewhat similar to purchasing an article on the installment plan, with this difference, however, that when you have gotten through paying the installments you own the article, whereas in the case of a water-works system, after paying yearly a sum more than equivalent to the interest on the capital invested for, say thirty years, the town owns nothing and still has to purchase the plant, if it desires to own it, for a sum of money in excess of what it originally took to build it.

With a view to determining what the difference in cost would be between a town's building and operating its own works, and granting a thirty-year franchise to an outside company with the privilege of purchasing at the end of that period, let us assume a town with a population of five thousand, providing no serious difficulty is encountered, the works should cost in the neighborhood of $35,000. During a period of thirty years probably about $8,000 worth of apparatus in a plant of this description would have to be renewed. A yearly sinking fund of 2 per cent. of this sum would therefore have to be provided for in the case of a municipal plant. With these figures as a basis the two following tables were compiled:

PRIVATE COMPANY PLANT.

Sixty hydrants at $30 a year per hydrant...	$1,800
Five hundred house connections at $6 a year.....	3,000
Disbursements of town for one year.....	$4,800
Disbursements of town for thirty years.....	144,000

MUNICIPAL PLANT.

Yearly interest on $35,000 at 5 per cent.....	$1,750
Yearly sinking fund to renew apparatus, 2 per cent. of $8,000.....	160
Yearly sinking fund to pay off bonds, 2 per cent	700
Yearly operating expenses, labor, fuel and incidentals.....	1,900
Disbursements of town for one year	$4,310
Disbursements of town for 30 years.....	129,300

A glance at the above figures will show a saving of $14,700 in favor of the municipal plant for a period of thirty years, to say nothing of the fact that if at the expiration of the allotted time the town desires to own the works it would be obliged to expend probably an equally large sum of money for their purchase.

Undoubtedly there are many small communities that desire a suitable water supply, and yet are not in a position to issue bonds

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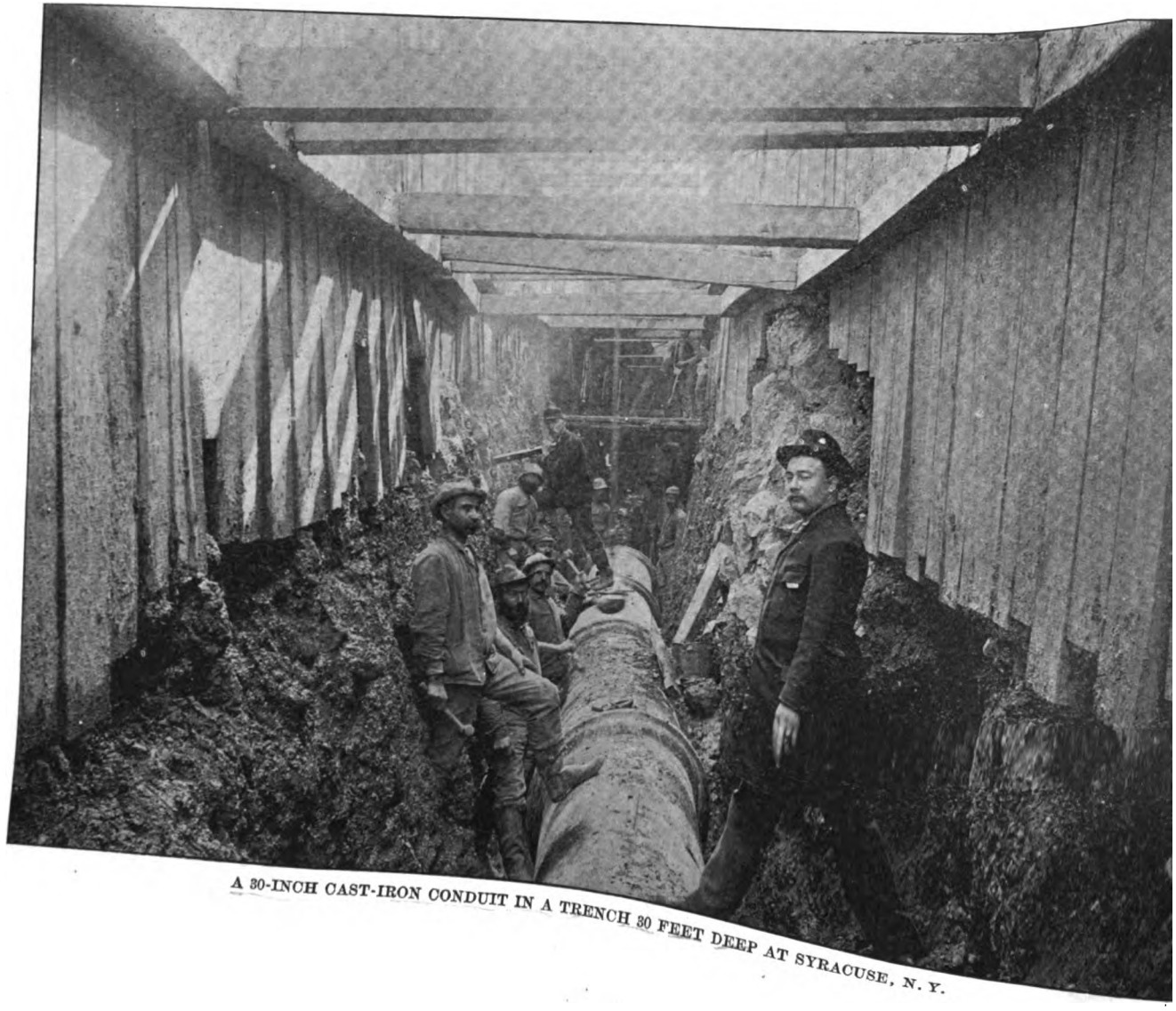

A 30-INCH CAST-IRON CONDUIT IN A TRENCH 30 FEET DEEP AT SYRACUSE, N. Y.

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and build their own works. An ingenious scheme to overcome this difficulty and obtain suitable water for both fire protection and domestic use was tried at Deansboro, N. Y., a village of three hundred inhabitants. A committee was appointed to appraise all buildings and contents. Fire protection was then offered on these buildings in return for a subscription for stock at the rate of 2 per cent. of the appraised value. Public buildings, such as churches, schools, etc., were protected at the rate of 2½ per cent., while stores were charged 3 per. cent. If a stockholder desired water for domestic purposes he was charged for it at the rate of $5 a year. A person not owning stock was charged at a much higher rate. It is claimed that this method of procuring fire protection and a suitable water supply has proven very satisfactory.

In these days there should be no serious difficulty in a small community procuring an abundant supply of wholesome water economically. The expense of erecting a pumping plant, providing, of course, one is necessary, may be reduced to a minimum by installing a gasoline engine or an electric motor for operating the pump. If an electric power station happens to be in the vicinity, current could in all probability be procured at an extremely low figure. The writer has had current offered him in a small town by the local street car management as low as nine-tenths of a cent per horse-power hour for pumping. With a five horse-power motor operating five hours a day, at the above figure, the cost for power would be 22½ cents a day or but $82.13 a year.

Equally good or better results from a financial standpoint can be obtained by the use of a gasoline motor. The small town of Oswego, Ill., with a population of about 600, pumps its water by means of a four-horse-power gasoline engine connected to the pump by a belt. During a fire which broke out there, the fuel cost of operating the plant for three hours while delivering 16,000 gallons of water against a head of 110 feet was 20 cents. In this instance the supply was taken from driven wells, to which the pump was directly connected. Cheneo, another small town in the same state, with 1,200 inhabitants, pumps its water by means of a twelve-horse power gasoline engine. The supply is drawn in this case from a deep well and delivered to a tank standing on a 130-foot tower. The cost of operating this plant per day of ten hours was stated to be $1, which is even less per horse power hour than at Oswego.

By the use of a gasoline engine, or even an electric motor, for pumping purposes, a town not only saves a large amount of money in first cost over a steam plant, but the operating expenses, which frequently prove a heavy burden to a small community, are materially lessened. At Oswego, for instance, the town marshal looks after the plant for a nominal sum yearly, while at Cheneo the plant is cared for by the street commissioner. In this way the cost of labor probably does not exceed three hundred dollars a year; whereas, were a steam plant made use of, this item alone would mount up as high as one thousand dollars.

From the foregoing it will be seen that a town desiring a water supply need not necessarily lay out a large sum of money in a pumping plant, nor apprehend an annual drain upon the tax-payers for operating expenses, as would have been the case a few years ago.

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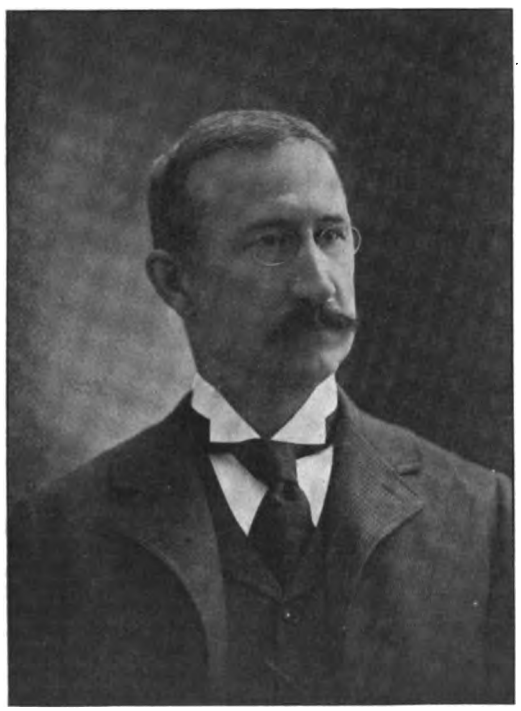
Taking, therefore, everything into consideration, it would certainly seem as though the average town could build and operate its own works economically, without being obliged to have recourse to the granting of a franchise, which may ultimately mean months, if not years, of litigation and the expenditure of large sums of money.

PAPERS ON MUNICIPAL IMPROVEMENTS.

The meeting of the American Society of Municipal Improvements at Washington, D. C., October 26, 27 and 28, brought out some of the most valuable papers that have been contributed to the literature of municipal improvements. Several of these appeared in the November number of MUNICIPAL ENGINEERING, which was published simultaneously with the holding of the meeting. Others appear in this number and still others will be published in full hereafter.



MR. N. P. LEWIS, C. E.,

PRESIDENT OF AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

A number of new members were admitted to the society. The receipts from all sources last year, as shown by the report of Secretary Fulton, amounted to $601.50.

A very interesting paper on tax-

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ation in the larger cities was read by Aug. Herrmann, of Cincinnati, and the report of the committee on review, by Geo. H. Benzenberg, of Milwaukee, was a valuable contribution.

Toronto, Canada, was chosen as the meeting place for next year, and officers were elected as follows:

President—Nelson P. Lewis, C. E., Brooklyn, N. Y.
First vice-president—A. D. Thompson, C. E., Peoria, Ill.
Second vice-president—P. H. Thomas, Parkersburg, W. Va.
Third vice-president—B. H. Colby, St. Louis, Mo.
Secretary—D. L. Fulton, Allegheny, Pa.
Treasurer—John L. Kennedy, Nashville, Tenn.
Finance committee—F. J. O'Brien, Oswego, N. Y.; F. A. Twamley, Grand Rapids, Mich.; G. F. Nichery, Bangor, Me.

President McKinley received the members of the society at the White House, and a reception was tendered them at the Arlington hotel by the commissioners of the District of Columbia. The members of the society also were taken to Mount Vernon and Marshall Hall during one afternoon of their stay in Washington.

The recommendations of the committee on municipal data, the report of which was published in full in the November number of MUNICIPAL ENGINEERING, were concurred in, and the executive committee, in connection with the chairman of the committee on municipal data, Charles Carroll Brown, was directed to endeavor to have the plan outlined by the committee adopted by the census bureau in its computation of data. The forms prepared by the committee will be submitted to members of the society by mail, when finally completed, for further suggestions, in the hope of making them as perfect as possible.

THE CONSTRUCTION OF SURFACE RAILROAD TRACKS IN PAVED STREETS.

To the President and Members of the American Society of Municipal Improvements:

GENTLEMEN — Your Committee on Street Paving has not had the success in securing papers for presentation to the convention which it had hoped and expected.

The committee appreciated the fact that the subject of laying and maintaining pavements had been thoroughly discussed on previous occasions, and as it was not directed by the last convention to submit a report upon any particular subject it was considered wise to try and present some new phases of the paving problem.

In the early part of the last summer a circular letter was addressed to members of the society in all of the cities represented, asking for papers upon the following subjects:

1st. The selection of paving material—that is, what material is best suited for certain conditions, taking into consideration first cost, economy of maintenance, ease of traction, durability, sanitation, etc. This problem will naturally have different solutions in different localities, and, under varying kinds of traffic, but a careful consideration of the special qualities of different paving materials should result in conclusions which will be of value and interest to the society.

2d. Railroad track construction in paved streets: the character of foundation, form of rail and kind of pavement best adapted for use in connection with tracks, having in view permanency of structure, with least possible disturbance of the surface for repairs, and a minimum of obstruction to the use of the street by vehicles.

3d. The obligations of street railroads and other corporations as to maintenance of pavements between their tracks, or over their sub-surface construction. Would not

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more satisfactory results be obtained if railroad companies were to pay a fixed sum per mile of track per annum to the city, and the latter assume all responsibility for repairs and renewals?

4th. Regulations to restrict and control the opening of pavements by corporations, plumbers and others.

It was explained that the committee did not wish to obtain descriptions of methods followed in various cities, unless these methods had special merit to recommend them, but was anxious to secure information which could not be obtained elsewhere, and which would be of real value to the members of the society.

While a number of responses were received to this circular they nearly all stated that it would be impossible for the writers to prepare a paper.

The committee felt that there was no subject at the present time of more vital interest to municipal officers than the effect of street railway track upon pavements, and it has ventured to make this the subject of special investigation and report.

The relations between street railway corporations and municipal officers is too often hostile rather than friendly. In many of the older cities such corporations have been given franchises which impose few, if any, obligations upon them as to the care of the pavements between their tracks. These franchises have usually been given in perpetuity, and the companies often seem to regard as an impertinence any criticism of the method of track construction, or of the condition of the pavement on the portion of the street occupied by them, while the suggestion that the company contribute even a portion of the expense of substituting a new pavement is so preposterous as to be ludicrous. Yet there is no problem requiring more patient consideration, or which should be taken up with a spirit of greater fairness than this one of street railway track construction, the best kind of pavement to be laid along and between the rails, and its proper maintenance.

An insolent disregard of the rights of the public on the part of some few railway corporations is doing more to bring about partial

TABLE SHOWING RAIL SECTIONS FAVORED BY STREET RAILWAY OFFICIALS AND THEIR OPINIONS AS TO KIND OF PAVING MOST SUCCESSFUL ALONG TRACKS.

Railroad Company.	Rail in general use. Section.	Height.	Weight.	Paving along rails on asphalted streets.	Can asphalt be successfully maintained along rails?	Objections to grooved rails.	Is Tee-rail favored in paved streets, if permitted?
Albany Railway	Side bearing girder.	9 in.	99 lbs.	Formerly granite toothing. Asphalt now carried to rails.	Yes.	Snow and ice fill groove.	Yes.
Binghamton Railroad Co.	Grooved.	9 in.	Johnson.	Asphalt against rails for last two years.	Yes.	None.	No experience.
Brooklyn Heights Railroad Co.	Side bearing girder and grooved.	9 in.	91 to 92½ lbs.	Asphalt along rails and stone toothing.	On outside, not on inside.	Not from dirt, but it is more difficult to maintain pavement than with side-bearing rail.	Yes, if permitted by city officers.
Buffalo Railway Co.	Semi-grooved.	9 in.	86 lbs.	Stone toothing.	No.	Snow, ice and dirt would cause great trouble with full-grooved rail.	Would probably be successful, but not permitted.
Cincinnati Street Railway Co.	Grooved, on cross ties not in concrete.	6 in. & 9 in.		Asphalt along rails both sides.	Yes.	None.	Not better than grooved rail now in use.
Denver Consolidated Tramway Co.	Tee, with crocketed cross ties on concrete.	6 in.	72 lbs.	Stone toothing	No.	No experience. Too much preferred.	Yes. Under local conditions, gauge 3½ ft. and street wide.
Detroit Citizens' Street Railway Co.	Grooved, laid in concrete—no cross ties.	Johnson.	99-999	Asphalt outside, brick between rails.	On outside, not on inside.	None.	Not better than section used and difficult to maintain pavement.
Lincoln Traction Co.	Tee.	6 in.	62 lbs.	Vitrified brick in all cases.	No asphalt in city.	No experience.	Yes.
Market Street Railway Co., San Francisco, Cal.	Side bearing girder and Tee.	Not given.		Stone toothing.	No.	Dirt makes rough riding. Nothing to recommend it.	Yes, with good, tough stone along rails.
Metropolitan Traction Co., New York.	Grooved girder.	9 in.	102½	Asphalt along rails and stone toothing.	Yes, but repairs are frequently required.	None, except difficulty in maintaining pavement.	Not permitted.
Nassau Railroad Co., Brooklyn.	Side bearing girder.	9 in.	99 lbs	Asphalt along rails and stone toothing.	Only with difficulty.	Impossible to keep track clean, except with asphalt pavement.	Yes.
Washington, D. C.	Grooved.			Asphalt along rails both sides.	Yes.	None.	
New Orleans Traction Co.	Side bearing girder.	Johnson.	99-996	Stone toothing.	So.	Dirt in grooves requires more power and makes rough riding.	Yes, on streets wide enough to accommodate vehicle outside of tracks.
Union Railroad Co., Providence, R. I.	Grooved.	9 in.	92½ lbs.	Asphalt against rails.	With difficulty.	No objections stated.	Not favored nor permitted. Neither stone nor asphalt can be maintained along them.
Toronto Railway Co.	½ grooved.	6¼ in.	72 lbs.	Stone toothing. Asphalt against rail in some cases.	No.	None.	Neither stone nor asphalt can be maintained along them.
Twin City Rapid Transit Co., Minneapolis and St. Paul.	Tee, laid on concrete—no cross ties.	7 in.	99 lbs.	Asphalt tried, but abandoned for stone toothing.	No.	Many objections, but not stated.	Yes.
Union Traction Co., Philadelphia.	Side bearing girder.	9 in.		Stone blocks both sides of rail.	No.	Decided objections on account of difficulty in keeping clean.	No, except with very light traffic and brick pavement.
West End Railway Co., Boston, Mass.	Side bearing girder; some grooved.	9 in.	99 lbs.	Stone toothing. Asphalt against rails in some cases.	Only with great difficulty.	Object to use, reasons not given, but obliged to use in some cases.	Favored, except for difficulty in maintaining any pavement.

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or complete municipalization of railroads than anything else. The question of compensation for franchises, the quality of service given the public, etc., are not the subjects which properly concern your Committee on Street Paving; but the method of track construction, the section of rail used, and the kind of pavement laid along and between the rails are proper and most important subjects for its consideration.

Early in August a circular letter was addressed to the officers of twenty-eight of the most important street railroad companies in the United States. This letter requested answers to the following questions:

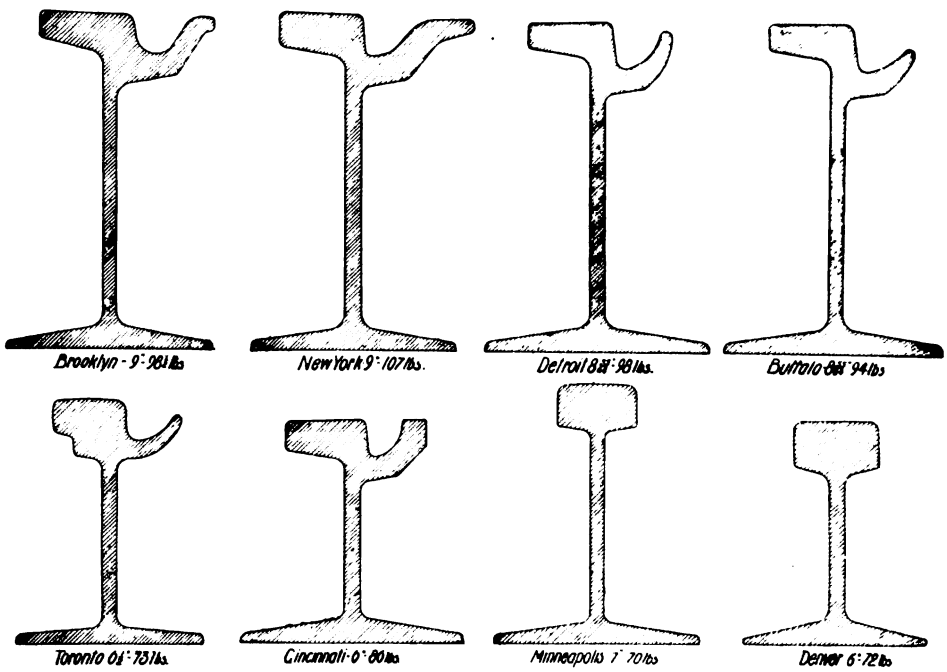
What is your standard rail section? Is it a side-bearing, grooved or T-rail, and is the form prescribed by the municipal officers? Is there any reasonable objection to the use of a grooved rail, and are you permitted to use a T-rail in any paved street?

Does your company lay and maintain the pavement between the tracks?

On asphalt streets is the pavement carried up to the rail on either or both sides, and, if so, do you find it difficult to maintain such pavement?

Do you favor the use of a T-rail in paved streets, and do you think that stone and asphalt pavement can be maintained along such rail?

Your committee wished to ascertain the views of the officers of important companies, known to be well-managed, and to see whether or not they were disposed to attach proper importance to this question of paving in connection with their tracks. The information asked for has been received from seventeen of the companies, and the general character of their answers will be seen from the accompanying tabular statement. The spirit of


Brooklyn - 9" 98 lbs
New York 9" 107 lbs.
Detroit 8½" 98 lbs.
Buffalo 6½" 94 lbs
Toronto 6½" 73 lbs.
Cincinnati 6" 80 lbs
Minneapolis 7" 70 lbs
Denver 6" 72 lbs

FORM OF STREET CAR RAIL USED IN DIFFERENT CITIES.

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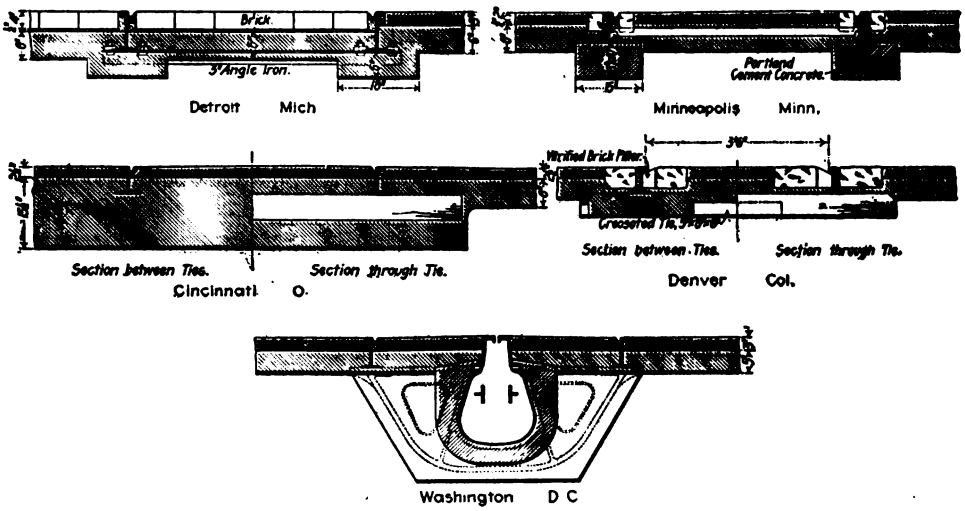
fairness manifested by most of the replies is gratifying, and indicates that the companies as well as municipal officers, are devoting much attention to the problem of paving that part of the street used by them. The fact is becoming appreciated that, as stated by the general manager of the New Orleans Traction Company:

In the construction of tracks in paved streets the pavement forms a large proportion of the expense, amounting in many instances to as much or more than the track construction proper, and as the stability of each depends largely upon that of the other, only the best material and methods in track and paving construction should be used, and that each should be laid without respect to expense, in the best possible manner, which will surely be the cheapest in the end.

The railroad companies must understand that the privilege of operating their cars in city streets is a very valuable one, and that when they occupy the central half or third of the roadway (as is usually the case in the narrow streets of eastern cities), they must expect to maintain the best class of modern pavement in thoroughly good condition. They can not expect to treat a public highway, purchased and improved by the people, as they would a private right of way on which they have exclusive rights. The municipality must also understand that upon good transit facilities depend in a large measure the expansion and development of the city, and that a corporation which is disposed to give good accommodations and quick transit is a public benefactor, and should be given every encouragement and facility for improving its service.



TRACK CONSTRUCTION OF STREET RAILWAYS ON PAVED STREETS IN DIFFERENT CITIES.

Repairs to track in paved streets are necessarily expensive, and every effort is now being made to build as substantially as possible. The laying of heavy rails upon a foundation of concrete dispensing altogether with wooden crossties is no longer an experiment, having been especially successful in Detroit, Denver, Minneapolis, St. Paul and Toronto. The methods of construc-

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tion in Cincinnati, Detroit, Denver, Minneapolis and Washington (the last for lines operated by sub-surface electric power) are shown by the accompanying sections. As to the form of rail, there is considerable variation, and difference of opinion, though that most in favor among railway companies is the 9-inch sidebearing girder weighing 90 lbs. or more to the yard, though in several places where permitted by the law or the municipal authorities the T-rail seems to be in favor, while municipal officers generally prefer a grooved rail. Considerable opposition has been manifested by the railway companies to the grooved rail, but when its use has been insisted upon, they have soon accepted the situation, and find that there is no difficulty connected with its use. One railway official writes:

> We do not use any grooved rails for the reason that they are very poorly adapted to the street car business. * * In fact, I know of no reason for the use of grooved rails anywhere, except that it is a fad of certain theorists who have no practical knowledge of the business, which, like other fads of the kind, such for instance as the narrow gauge for railways, must have its little day of popularity among the ignorant and inexperienced, to be finally cast aside as soon as the public have had experience enough with it to know what it really is.

The T-rail would be deservedly popular were it not for the difficulty of maintaining pavement of any kind alongside of it, though in Minneapolis, St. Paul and Denver it is claimed that this can be successfully done. The question of pavement alongside of the rails (especially inside) in asphalted streets is difficult of solution. One of our replies says:

> It has been my experience in ... between the rails and the tracks and for a foot outside is a much better kind of pavement than asphalt.

Your committee is disposed to agree with the sentiment that asphalt and street railroad tracks are hereditary enemies, but is convinced that with substantial track construction, and the proper kind of rail an asphalt pavement can be maintained on both sides of the rail where the traffic is light; and that with the use of a toothing course along the inside of the rail where the traffic is heavy asphalt can be used on railroad streets as well as any other material.

After a careful consideration of the facts and opinions elicited by the letters received in response to their inquiries, and such personal investigations as have been made, your committee would report the following conclusions:

Only the most substantial and permanent track construction should be permitted in important paved streets. The tracks should be laid upon a concrete foundation, metal crossties being substituted for wood, resulting not only in greater permanency, but saving depth of concrete and excavation.

The best form of rail is the groved girder, nine inches in depth, where streets are paved with stone, and seven inches deep where paved with asphalt. In some cases where streets are very narrow, and vehicles are obliged to follow the tracks, the nine-inch side bearing-girder may be preferably selected, stone blocks of granite or trap being laid along the inside of each rail, and at the same level as the head of the rail. On exceptionally wide streets, where the traffic is not heavy, and ...

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The pavement along the rails will depend upon that used on the remainder of the street. If the latter is of stone blocks the pavement along and between rails should be the same, but in all cases should be of selected blocks upon a substantial concrete foundation, the joints filled with fine gravel and paving pitch. If of brick the same practice should be followed, the joints along and between rails being filled with similar paving pitch in whatever way the joints on the remainder of the street may be treated.

On asphalted streets the asphalt may safely be carried up to the back of the rail, and if full-grooved rails are used, and the vehicular traffic is light, it may be carried entirely across the roadway. For heavy traffic the spaces between the rails and tracks should be paved with selected granite or other hard, tough blocks, laid on concrete with pitch and gravel joints. For moderate traffic a toothing course of carefully selected blocks, four inches wide and varying in length about three inches, but in no case more than ten (10) inches long, should be laid along the inner side of the rails, whether grooved or side-bearing. These blocks may be laid in pairs of two long and two short, in which case the asphalt along them can be tamped more thoroughly.

In all cases blocks next to the rail should be bedded in rich cement mortar, rather than laid upon a sand cushion. The spaces under the head of the rail should be filled with fine cement concrete, leaving a vertical joint between this filler and the pavement, whether the latter be stone, brick or asphalt.

Openings made for repairs to track should be immediately restored before the stone blocks become injured, or the adjacent pavement or foundation disturbed. Such openings being shallow, this can always be done without danger of settlement.

Respectfully submitted,
N. P. LEWIS,
M. Am. Soc. C. E., Chairman.
EDW. B. GUTHRIE,
M. Am. Soc. C. E.
GEO. N. AMES.
Committee.

A STUDY OF PAVING MATERIALS.

By George W. Tillson, M. Am. Soc. C. E.

The discussion of paving materials is nearly as old as pavements themselves. In the early times availability generally determined the kind to be used, but as our cities increased in size and importance, the question as to what was the best received, and is now receiving, a great deal of attention. It is not easily settled, because the best material for one section is not necessarily the best for another. However intelligently the question be considered, it will never be possible to arrive at a conclusion that will suit all cases. A perfect pavement, however, possesses certain qualities and by a careful study of these it will be possible to assign them a value which will be permanent in all locations. By next taking up the different materials offered for paving purposes, and examining them with reference to these already

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assigned values, a result can be reached that will give a fair average value of any material. These results can be tabulated and by knowing all the conditions affecting any street, a proper selection can be made by applying the table.

A perfect pavement should be cheap, durable, easily cleaned, present little resistance to traffic, not slippery, cheaply maintained, favorable to travel, and sanitary.

The question of first cost is very important. As with individuals so it is with corporations, what is most economical in the end must often be given up and an inferior article adopted, because the available funds will not permit the required outlay. If the best can not be used the one nearest to it must be taken, provided it comes within the appropriation. An advocate of a new paving material is almost invariably met with the question, what will it cost? If the price be extreme he will have a hard task to introduce it no matter how great the other attractions may be. Cheapness then has been given a value of 15 out of a total of 100.

Durability is probably the most important quality of any material. Ultimate cost depends as much upon this as upon first cost. No matter how cheaply a pavement may be laid or how pleasing it may be, if it require constant and frequent renewal its real value is greatly diminished.

This is especially true in large cities, as the delay and inconvenience to business on a crowded street may often amount to more to abutting tenants in dollars and cents than the actual cost of the pavement. In a country, too, like America, where the tendency is to build and then allow repairs to take care of themselves, durability is most important. Its value has been fixed at 21.

The growing demand for clean streets in our cities has brought into prominence any pavement that can be easily cleaned. What this amounts to in money can be appreciated by a statement made in December, 1896, by Colonel George E. Waring, Jr., at that time street cleaning commissioner of New York city. At a meeting of the American Society of Civil Engineers he said that if all the streets of New York were paved with asphalt where the grades would permit and the street car tracks constructed with grooved rails, the cost of sweeping the entire city would be reduced from $1,200,000 per annum to $700,000. That is, there would be a saving annually of $500,000, which capitalized at 4 per cent. would amount to $12,500,000 in a city that at that time had a pavement mileage of 431 miles, of which ninety-four were already paved with asphalt. Easily cleaned is assigned 15.

Resistance to traffic is an important item. In fact, one of the chief provinces of a pavement is to reduce this, and consequently a pavement that can bring this to a minimum is of particular value. A mechanical device that would reduce the friction of a machine 50 or even 25 per cent. would be of incalculable benefit, yet a good pavement on a street accomplishes this. It makes one horse do the work formerly performed by two. Its assigned value is 15.

The slipperiness of a pavement depends primarily upon its material, but a great deal upon its condition. The former will be considerable here. The efficiency of a draft-horse must vary with his foothold. If it be good he will

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CASS AVE., NORTH FROM LEDYARD STREET, IN DETROIT—PAVED WITH ASPHALT IN 1889.

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be able to use his entire strength to draw his load, while if he be in constant danger of slipping and falling he can accomplish very little. Very few statistics have been gathered on this point. One case can be given, however, when observations of traffic were being taken on several streets in the winter time. On the first day the hourly traffic was at the rate of 225 tons between 11 and 12 o'clock, reaching 270 tons between 3 and 4 o'clock. On the day following the traffic between 11 and 12 o'clock was 305 tons. About 2 o'clock snow began to fall, making the pavement very slippery, reducing the travel to such an extent that it had fallen off to 40 tons between 3 and 4 o'clock. That is, it was comparatively deserted. All of the other streets upon which observations were being taken showed the same results. "Not slippery" has been valued at 7.

Maintenance is closely allied to first cost. Unless it be known and considered in the adoption of a material a choice can not be made intelligently. What seems to be sound selection will often be ruled out by the cost of repairs. Any material will require constant attention but that one which needs the least and permits that to be done with the least inconvenience to the public is of most value. "Cheaply maintained" has been given a rank of 10.

By "favorable to travel" is meant the ease and comfort that is enjoyed in driving over a smooth pavement, and the decrease in the wear and tear of vehicles and horses. No attempt ever has been

for enjoyment as well as use this property must be considered. The large number of bicyclists constantly on our highways makes this especially important. Its value is placed at 5.

Another function of a pavement is to preserve health. In large cities it is impossible to prevent decaying matter from being deposited in our streets. If a pavement be of such a character that any of this collect in joints so that it is not removed by the street cleaners, it can not but be very deleterious to the general health. Consequently a pavement that is impervious to water has a smooth surface and is not itself composed of organic matter will be sanitary. Noise, too, must be considered. A noisy pavement prevents sleep, rasps on the nerves of the sick and prevents conversation on the street. This question of noise is of such importance that in Greater New York estimates have recently been made for repaving around all school-houses in the city with a smooth and comparatively noiseless material. Sanitation is ranked at 13.

Having thus briefly outlined the characteristics of a pavement and assigned them a value, it will now be in order to take up these characteristics with reference to the different materials, and apportion to each its amount according as it approaches perfection in each property.

The pavements to be considered are granite blocks, laid on 6 inches of concrete with tar and gravel joints, called granite A; granite blocks laid on sand, with joints filled with the same, called granite

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ADAMS AVE., WEST, IN DETROIT—PAVED WITH BRICK IN 1896.

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or cement; Belgian trap blocks on sand; macadam eight inches thick and cobblestone. Wood has not been taken, because it is only being used now in some of our western cities, and, as laid, can only be considered as a substitute for a pavement. It may be said that this is practically true of cobblestones. That may be so, but its use illustrates the scope of the table. This table, according to its present values, is available only in the vicinity of New York City. But the theory of it is correct, and modifications can be made so that it will apply to any section desired.

First cost varies, of course, in each locality, and each material will vary in its percentage as the price varies. Taking the average of the bids received in Brooklyn in 1897, we have

Granite A	$2.50
Granite B	1.65
Asphalt	1.75
Brick	2.00
Belgian	1.40
Macadam	0.75
Cobblestone	0.40

all per square yard complete.

Assuming their value to be inversely as their cost we get, granite A 2, granite B 4, asphalt 4, brick 3, Belgian 5, macadam 7 and cobble 14.

It is somewhat difficult to assume any definite period as the life of a pavement. In some cases the amount of traffic determines it entirely. But when a pavement is laid of perishable material like asphalt or wood, while wear will hasten the end, it has a period of life beyond which it can not go. Assuming the traffic then to be normal the time the different materials should last with ordinary repairs is:

Granite A	25 years.
Granite B	20 "
Asphalt	15 "
Belgian	20 "
Brick	15 years.
Macadam	8 "
Cobblestone	18 "

Figuring as before we have for their percentages:

Granite A	21
Granite B	17
Asphalt	13
Brick	13
Belgian	17
Macadam	7
Cobble	15

Some figures already have been given as to the value of having a pavement that is easily cleaned. The street that uniformly presents a smooth and even surface can be cleaned at much less expense than one that is rough and uneven. Working on this principle granite A gets 11, granite B 8, asphalt 15, brick 12, Belgian 7, macadam 5, and cobble 2.

Many experiments have been made to determine the amount of force necessary to draw a load over different roadways. The results vary greatly as the attendant conditions are so many that tests can not be expected to agree except as to general results.

According to the best authorities the number of pounds required to move a load of one ton at a speed of three miles per hour, the grade being level is:

Granite A	36
Granite B	45
Asphalt	17
Belgian	38
Macadam	42
Cobblestone	75

Brick must be between asphalt and granite A.

This then will give a percentage to granite A of 7, granite B 5, asphalt 15, brick 11, Belgian 5, macadam 5, and cobble 3.

The relative slipperiness of the different materials often has been discussed. It varies greatly with its condition. For instance, asphalt is more slippery when it is dirty and wet, granite when it is

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BOGG STREET, WEST FROM WOODWARD, IN DETROIT—PAVED WITH BRICK IN 1898.

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clean and dry. Extended observations were taken in London by William Haywood, engineer of the commissioner of sewers, in 1873, to determine the number of accidents occurring on different pavements. From his results he deduced that a horse would travel 132 miles on granite, 191 miles on asphalt and 330 miles on wood without having an accident of any kind. In 1885, Captain (now General) F.V. Greene had a series of observations made in ten of the principal cities of this country for the same purpose. From these he decided that in the United States a horse would travel on wood 272 miles, on granite 413 miles, and on asphalt 583 miles without an accident. In both of these cases the falls were divided into those upon the knees, the haunches and complete falls. Falls upon the knees on a rough pavement should not wholly be charged to slipperiness, as a great many must have been caused by stumbling. Captain Greene found that of a total of eighty-four falls, sixty-eight were upon the knees. Assuming that one-half of the latter were stumbles only, the deduction would be that a horse would travel 698 miles on granite without an accident due to slipperiness. These results of course are general. From these and other observations, granite A is given 6, granite B 5, asphalt 3, brick 6, Belgian 4, macadam 7, and cobble 5.

The cost of maintenance of pavements varies greatly in different cities. It is governed principally by the character of the material, amount of traffic and the condition in which the streets are kept. What is good repair in one city would not be allowed in another. The records on this subject are very meager. Systems vary in all places, and not much attention is paid to the cost of any particular street. Granite well laid requires very little repairing. Asphalt has generally been repaired by contract after the expiration of a five-years' guarantee. Some cities pay a price per yard for the entire street; some pay for the actual quantity of new pavement, and others for the amount of material used. Under ordinary traffic the repairs should not cost more than six cents per yard per annum. Brick has not been in use long enough to obtain reliable information upon its cost of maintenance. In this paper it has been assumed to be the same as asphalt. Belgian block requires but little repairing, as it is hard and well resists the action of travel. The cost of maintaining macadam is great and variable. The reports of the city of Glasgow, Scotland, show that the total cost of macadam repairs for the years ending May 31, 1896, and 1897, was ten cents per yard. In London they sometimes reach sixty cents per yard, and in Paris forty-four cents. In Nashville, Tenn., the stone used is so soft that the streets often require resurfacing several times a year. Traffic tells very quickly on this kind of a pavement. The values allowed are: Granite A 10, granite B 7, asphalt 6, brick 6, Belgian 7, macadam 3 and cobble 2.

Probably no figures can be found upon which can be based a calculation for "favorable to travel." Yet the saving to livery men, firms and corporations employing many teams must be great when poor pavements are replaced with good. Stone pavements are very severe upon both horses and vehicles, especially when they are a little out of repair. The allowances are made arbitrarily. Under this head gran-

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ite A has 3, granite B 2, asphalt 5, brick 4, Belgian 2, macadam 5 and cobblestone 0.

There is a great difference in the sanitary value of the materials in question. Asphalt can be kept absolutely clean, it is impervious to water, free from noise and has all the requirements of a sanitary pavement. Granite A and brick have their joints well-filled with permanent material and have an even surface. Granite B and Belgian have joints loosely filled with sand, which is soon swept out more or less and replaced with street refuse of all kinds. Decaying as it does it is offensive and detrimental. A cobblestone pavement never can be kept clean. To make it so would remove all the earth that maintains the stones in place. All stone pavements are very noisy and so are illy fitted for streets near hospitals, school-houses, churches or similar buildings. There is no doubt but that the noise from stone pavements contributes largely towards all nervous disorders. Macadam is extremely dusty, absorbs moisture of all kinds and is hardly to be considered for a city street, though it ranks high in some respects. In the old city of New York the number of deaths from all causes in 1892 was 44,329; 1893, 44,486; 1894, 41,175; 1895, 43,420; 1896, 41,622; and in 1897, 38,877, showing an absolute decrease in that period of 5,452, despite a large increase in population. This is a remarkable record. It is accounted for by increased sanitary measures in general and largely to the laying of asphalt pavements on the east side where the population is larger per acre than in any city of the world. The streets have been kept clean and they are in a measure the recreation grounds of the people. As a sanitary pavement then granite A receives 9, granite B 7, asphalt 13, brick 10, Belgian 5, macadam 5, and cobblestone 2.

The table can now be completed. By summing up the values under each head the true worth of each material is obtained, and by comparing these totals with each other we arrive at their relative rank.

	Percentage.	Granite "A."	Granite "B."	Asphalt.	Brick.	Belgian.	Macadam.	Cobblestone.
Cheap	14	2	4	4	3	5	7	14
Durable	21	21	17	13	13	17	7	15
Easily cleaned	15	11	8	15	12	7	5	2
Light resistance to traffic	15	7	5	15	11	5	5	3
Not slippery	7	6	5	3	6	4	7	5
Cheaply maintained	10	10	7	6	6	7	3	2
Favorable to travel	5	3	2	5	4	2	5	0
Sanitary	13	9	7	13	10	5	5	2
Total	100	69	55	74	65	52	44	43

Having constructed the table it will now be in order to illustrate its use. Assume, for instance, a street over which the traffic must be great and continuous. Ultimate cost is of great importance. It overrules first cost. Light resistance to traffic and also foothold for horses are ruling elements, so that any power may draw the maximum load. The items first to be studied, then, are: Durability, maintenance, traction and the not-slippery property. Consulting the table and combining the values for these items, granite A has 44, granite B 34, asphalt 37, brick 36, Belgian 33, macadam 22 and cobble 25. Granite A has such a decided lead over the others that it would hardly be necessary to make a further examination before coming to a decision, but when the figures are as close as the next four, ranging from 37 to 33, a careful study of the re-

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maining qualities would be required. In this particular instance granite A stands so near the top on the totals, and so far ahead in the special requisites it would seem that no mistake could be made in selecting it as the material to be used.

Consider next a residential street built up with homes whose owners have means sufficient to afford the best of anything they desire, and while not wishing to be extravagant they do want and expect to have the best pavement that can be laid without regard to expense.

This is a different proposition. First cost, durability and maintenance, of the utmost importance before, can be left out entirely. Easily cleaned, not slippery, favorable to travel and sanitary are the governing characteristics. Now granite A has 29, granite B 22, asphalt 36, brick 32, Belgian 18, macadam 22 and cobble 9. Asphalt possessing all the desired properties in so high a degree should be selected without question. It may be said that durability and maintenance are too hastily disposed of, and that by considering them the results would be changed. But here is the point of the whole argument: the property-owners can afford the best. They would not carpet their drawing-rooms with hemp matting because it would last longer than tapestry, nor furnish their dining-room table with crockery and pewter rather than with china and silver. The idea is the best material under required conditions. The above conclusions would generally hold good for the best retail business streets their pocketbooks will admit. This requires careful consideration. The destructive action of travel is almost eliminated; durability will be governed by the action of the elements. Every quality but light resistance to traffic must be taken into account. This gives granite A 62, granite B 50, asphalt 59, brick 54, Belgian 47, macadam 39 and cobble 40. Granite A leads, but it gets its supremacy from its great durability under traffic, a property that is not required here. Leaving this out, there remains granite A 41, granite B 33, asphalt 46, brick 41, Belgian 30, macadam 32 and cobble 25. All but the three leading materials can now be eliminated, leaving for further consideration granite A, asphalt and brick. Now, while durability has been left out, its value has been determined by the action of traffic and weather. In this case action of traffic is left out, and when it is considered that asphalt has a life that is determined by climatic conditions, irrespective of the action of traffic, it will be seen that in such a case as this granite A and brick can consistently be placed above it. These two materials now stand at the same value, 41, but by examining the table it will be seen that granite A gains 4 points over brick on maintenance, simply on account of its superiority under heavy travel. Leaving that out of our total, granite A has 31 and brick 35, and this is plainly the proper material for the street.

If the property-owners, however, think the price too high, and prefer granite with its inconveniences to the more pleasing brick, then gran-

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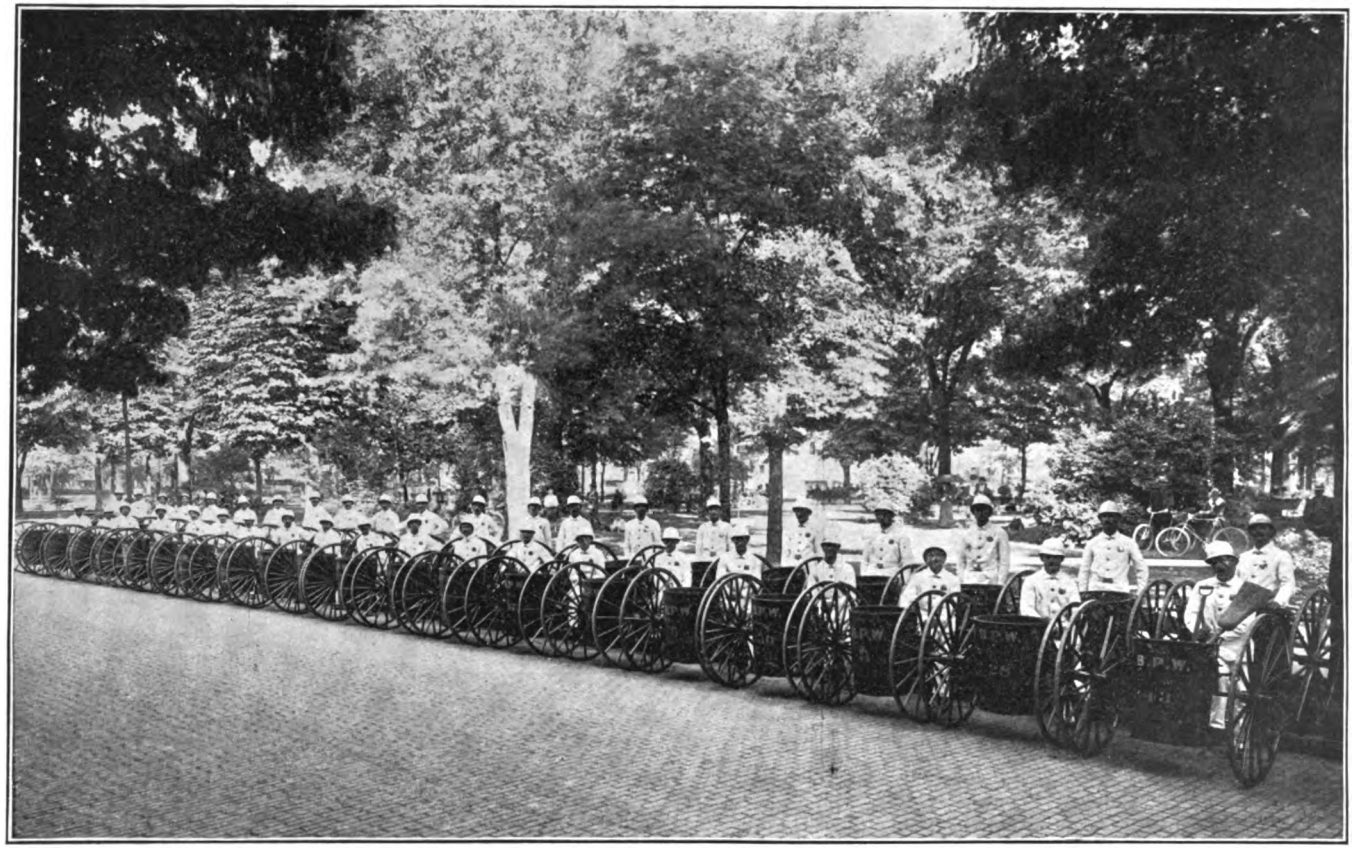

THE STREET CLEANING DEPARTMENT OF DETROIT—MORELAND'S "WHITE WINGS BRIGADE."

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traffic is not heavy, but the road is needed to facilitate the intercourse between towns, or to connect a suburban village with the parent city, sanitation, easily cleaned, durability (except as to action of weather) and light resistance to traffic can be eliminated—sanitation and easily cleaned because on a sparsely settled road matters are unimportant that could not be allowed in a city; the other qualities because no heavy loads will be attempted. There will remain then, granite A 21, granite B 18, asphalt 18, brick 19, Belgian 18, macadam 22, cobble 21. Here the values are more nearly alike, but the cost of the first five materials will rule them out, when there can be no question between macadam and cobble on account of the undesirability of the latter, even though the former has but one point in its favor. By modifying the foundation for brick under these conditions it would very likely make a good showing and in many localities prove the proper material.

The above illustrates the workings of the table and while there are many imperfections in it, as much of it has been settled arbitrarily by the author and allowance must be made for the personal equation, it does seem, to him, at least, that it is a step in the right direction—that it is getting away from glittering generalities and establishing plain figures for certain elements that have not been valued in exact terms before, so that they can be understood and of service to those wishing information. If this attempt bring forth discussion sufficient to place these figures at their true values, the author will feel fully repaid for the labor expended upon this attempt.

THEORY AND PRACTICE OF ASPHALT MIXTURES.

By A. W. Dow, Inspector of Asphalts and Cements, Washington, D. C.

The testing or examination of asphalts for paving has been carried on in a more or less intelligent manner from the time of the laying of the first pavement with this material, and although our knowledge, which has been gained by slow stages, is yet very limited, still what we now have is such as to give us confidence in our predictions. I have no doubt but that inferior material has proved the better. Failures and paradoxes are the great educators in all industries; the one gives us something that must be overcome while the other gives us something to reason on. The asphalt paving industry is no exception to this rule and I would not be far from right if I said it possessed to those who have not made a careful study of the subject

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directly to avoid failures, but merely to present in as practical a way as possible the influence the selection of different ingredients has on the character of the pavements in which they are used and discuss the theory of the cementing properties of asphalts. In this way the cause of some failures will be made self-evident and why poor pavements are often made with good asphalts.

I do not think that I am wrong when I say that many engineers do not explain the theory of phenomena met with in asphalt construction. This is because they do not apply the proper physical laws in their reasoning. And this is not surprising when we consider that the cementing and other materials in general use in engineering work are solids and involve the laws governing the cohesion and adhesion of solids for each other; while in the case of asphalt construction we have entirely different principles involved—those governing the attraction and adhesion of liquids for solids, for asphalt paving cements are in every sense of the word liquids. This may be novel to some present, but an examination into their physical properties will demonstrate the correctness of the assertions.

Asphalt cements flow at all temperatures, the flow being quite marked at 75 deg. F., and as the temperature is raised or lowered the flow becomes more rapid or sluggish, this change taking place to a different degree in different asphalt cements.

There are many every-day illustrations of the flow of these thick liquids, the commonest being the oozing through the smallest cracks in the barrels or boxes containing them. I have some illustrations of this flow at three different temperatures, 26, 75 and 140 deg. F.

Possibly you wonder why I have taken such a high temperature as 140 deg., but it is because I have found asphalt pavements to reach that high temperature on a hot day, and in the manufacture of a pavement the maximum as well as the minimum temperature to which it is subject should be considered in the examination of its ingredients.

The cement I have taken to illustrate the flow at the temperature mentioned is one of our regular paving cements such as is used in the wearing surface of an asphalt pavement. This first exhibit illustrates the flow of this cement in one week, having been kept at a temperature of 26 deg. F. A two-inch cube with a perfectly smooth flat face was placed on this board directly over the hole. Its flow into this hole, although not considerable, is sufficient to show that the cement is liquid at this temperature. This illustrates the flow of a similar cube placed in like manner on this board and kept at a temperature averaging 75 deg. Here is a third cube similar to the others and treated in like manner except that it was kept at 140 deg. for one hour. At this temperature the flow was visible.

I have found that these thick liquids belong to the class of fluids that will rise in a capillary tube thus showing their strong attraction for solid bodies. I believe that the laws of capillarity are the principal ones involved in the cementing in asphalt paving mixtures; and when applied will explain phenomena heretofore considered inexplicable.

From the foregoing it is evident that asphalt cements may be looked upon as liquids, but there is another property possessed by them which must be considered that does not belong to liquids, as we com-

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monly speak of them, and that is they become brittle at certain temperatures. Asphalt cements as I have before mentioned become sluggish or hard as their temperature is lowered and at a certain hardness show evidence of brittleness, this brittleness increasing as their temperature lowers. It may be well to explain here that we can increase or diminish the softness of an asphalt cement at our will by the addition of a flux or harder asphalt. Thus we are able to obtain any degree of consistency. As asphalt cements become brittle at a certain hardness and this increases as they harden, it is most desirable to have the cement as soft as possible, thus having the temperature at which it becomes brittle at the minimum degree.

The problem now to deal with is the selection of the sand; what sand which can be practically handled can be used with the softest possible asphalt cement and yet make a desirable pavement—that is, one that will not shove or mark too much under the traffic of the particular street on which it is to be laid on the hottest day. Such a mixture will be best able to resist the cold. Of what character must the sand be to fulfill this requirement?

From what has been said, it is evident that asphalt mixtures are sand grains of various sizes held together by the forces of attraction and adhesion of a liquid that we call asphalt cement. The idea of a liquid binding sand grains together is not as novel as one might imagine on first thought, and a very common example of this phenomena is exhibited by a sand beach which the tide has just left; we find here that the sand grains are held together so firmly by the limpid liquid water that a wagon may be driven on it and scarcely leave a mark. That this hardness is due to the presence of water in the voids of the sand is evident, for when the sand dries it becomes loose and easily displaced. I had a good opportunity at one time to illustrate by a wet sand why I preferred that particular sand for paving. When first appointed to my present position, I took occasion to make a radical change in the grade of sand to be used in the asphalt pavements. A gentleman connected with one of the paving companies and myself were watching the unloading of the first lot of the new sand. The sand was wet and cheesy, so to speak—that is, it could be cut out in big cakes. It did not look like a good mortar sand.

My companion remarked that that was not what he would call a good sand, and asked me if I was not afraid that I had made a mistake.

I called his attention to how much more strongly this sand, which was finer, was held together by water than the sand he had previously used, and explained that it would be held together proportionately stronger when asphalt cement occupied the voids. Practical experience has demonstrated the correctness of this choice of sand. That much can be learned from a sand when wet, as to what value it will have for paving, can be shown by comparing the two grades of sand just spoken of. On comparing these two sands when wet, we find one (the finer) packs remarkably hard, while the other packs but slightly.

Looking upon asphalt cements as liquids, we would expect to find an analogous result when paving mixtures are made with these two sands, using with each the same asphalt cement—that the mixture made

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with the finer sand would be harder than that made with the coarser. This is what we find in practice: While using a much softer asphalt cement with the finer sand than with the coarser, equally hard mixtures are produced. The cause of this is explained by the fact that the voids in the finer sand are much the smaller in size, which means that the sand grains are closer together. It is a well known fact that the smaller the space between two solid bodies that are held together by the attraction of a liquid between them, the greater the adhesion.

There are two grades of sand that have small voids, one that is composed of all very fine grains, and the other is a sand with the grains so graded from coarse to fine that all the large voids are filled with smaller grains, and their voids in turn filled with still finer. The latter is the most desirable sand for several reasons. Among them are: it is more easily handled in the manufacture of the pavement, and it requires less asphalt cement, not alone because the per cent. void is less, but the total surface area of the sand grains is smaller.

I have also found that the shape of the grains has considerable influence on the hardness of the mixture. The more round and smooth the grains of a sand, with all other conditions being the same, the softer the asphalt pavement made therefrom. The great difference in pavements due to the use of different sands is not appreciated by many. It is not merely a theoretical difference to be put aside as too trivial to consider in practical work, for there is nothing responsible for more failures than the use of the wrong sand.

The difference in pavements due to the character of the sand used can be well illustrated by some practical instances. The pavements laid in this city in the summer of 1894 mark as much and in some cases more from traffic than do those laid here last year, and some of the former crack in cold weather. On comparing the records of these pavements the asphalt cement in the former is found to be 20 deg. of penetration harder than that in the latter pavements, so that the difference must be due to the sand. An examination of the sands show that they both have moderately sharp grains with the following mesh composition:

					1894. Pavm't.	1897. Pavm't.
Retained on	20	mesh	per linear	inch	4 5	2.5
"	40	"	"	" ..	40.0	21.0
"	60	"	"	" ..	32.0	35.0
"	80	"	"	" ..	9.5	8.5
"	100	"	"	" ..	6.0	10.0
Passing.	100	"	"	" ..	8.0	24.0

My attention was first called to the importance of the shape and character of the sand grains a few years ago. I was required to make an examination of some paving materials for a western city and found that the asphalt cement was as hard as any we were using here. The sand was moderately fine and, judging from past experience, I believe that a softer asphalt cement could be used with it. As the climate of this city was subject to greater atmospheric range and much lower temperatures than Washington, I wrote advising the use of a softer asphalt cement. I was much surprised to hear in reply that they had commenced work on the paving, and that the pavement already laid was so soft that it would not be advisable to make it still softer. An investigation was immediately started to discover the cause of this softness. Nothing was found wrong until I examined the sand with a glass when the grains were found to be so smooth and round that they re-

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sembled polished glass balls. On further investigation in the laboratory it was proved conclusively that there was a decided difference in mixtures made with sand that was smooth and round and that which was angular. All else being the same, the mixture made with the smooth sand was much softer than that made with angular sand. This hardness of paving mixtures made with angular sand is undoubtedly due to the keying into each other of the irregular sand grains. Too sharp a sand, that is one that would be so jagged as to be liable to have pieces easily broken off, is not desirable, nor for that matter is the use of any sand whose grains are liable to fracture.

As sand is 90 per cent. of the pavement why should it not be the most important ingredient to consider, and when a pavement is at fault why should it not be more responsible than the asphalt which now bears the brunt of all failures?

BETTER WORK AND BETTER PRICES FOR ASPHALT AND OTHER PAVEMENTS.

By J. W. Howard, C. E.

A city is a body which lasts so long that cheap first cost of its public work is not true economy, if subsequent maintenance and renewals are thereby increased. Economical maintenance of pavements for long periods of time results in a far greater saving than a small reduction in their first cost.

Seventeen years ago, being convinced that the equipment of city streets was a branch of engineering much neglected, I resolved to devote careful attention to the problems involved. Water-works, sewers, and sanitary engineering had been placed in the hands of scientific men, who made our cities more healthful and prosperous, as well as demonstrated the great economy their election or appointment to office sufficient to make them competent to expend public money upon city streets. City engineers, often well informed, did not dare, for the sake of their positions and daily bread, to warn or instruct mayors and aldermen concerning pavements and methods which were experiments, to say the least. In many of our cities there are "unwritten political laws" which unfortunately keep well-informed subordinate officials in silence, for the benefit of friends of higher officials who are sometimes paving contractors. To borrow a military expression I felt I could make the most progress along lines of least resistance. Few en-

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sonal experience of officials and others.

Our cities had a few good pavements, many bad ones and most streets not paved at all. The subject was a chaos with a few men trying to establish method and system.

Asphalt pavements had gained headway in Europe and were steadily increasing in our cities. Their quiet, clean, even surfaces attracted much attention and showed everyone that good pavements were worth seeking. Washington became an object lesson and others soon followed.

Asphalt pavements compelled other kinds to be better laid or cease to be used. With the guarantee of asphalt pavements for a term of years, it was discovered that this form of roadway, when properly laid and constantly kept in order, was the most economical of all pavements, as compared with other pavements under like conditions. Considering the cost of maintenance under wear, renewals over openings to pipes, street cleaning and the reduced cost of traffic, we at once realize the true economy of asphalt pavements and why they became the standard for cities.

Brick pavements came forward with promise of lasting success, especially in small cities near clay districts. They have suffered from nothing so much as prices, so cheap as to cause a lowering of quality.

Much improvement has been accomplished and more will follow on our streets. Pavements are a necessity for health, comfort and business. Granite block, asphalt block, brick and other pavements, made of detached pieces, are now laid on concrete foundations and with joints filled with bitumen, or other cementing substance. Coal tar and its products have been cast out of all street pavements. They must not be used as a substitute for asphalt or natural mineral pitch. Asphalt pavements are successful and economical only when made of materials tested by long use, and put together by honest and competent men.

Formerly the principal danger was the neglect of pavements when once laid. We have learned the benefit and economy of "a stitch in time saves nine."

At present a new danger confronts cities and contractors. It is that prices are too cheap to warrant good work. Many contractors formerly engaged in other kinds of work and capitalists who have listened more to promoters than to well-informed engineers, have entered the field of asphalt paving, without sufficient knowledge of asphaltum, and the kinds good for paving, residuum oil, sand, cement, stone, machinery methods, experience and expense, required to lay and maintain a successful pavement. Cities are reluctantly compelled to either enforce the paving specifications to the injury of contractors, or where "political influence" is strong, poor work results, either from relaxing what the specifications require or by adopting poor ones.

The burden of repairing poor pavements is startling many officials who must later face their constituents with unwarranted tax bills. It is not good public policy nor sound business to have pavements laid at prices less than the cost of good work. While a city must require bonds for construction and repairs, it must not rely upon bonds and guarantees alone. It must exercise due inspection of work in progress or run the risk of subsequent proof that this was not done, and the bondsmen thereby be relieved of responsibility.

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I could mention many cases where asphalt pavements have been laid as required, but at a loss in money to the contractors; others where the specifications were neglected at a loss in quality to the cities. In all cases additional subsequent expense for the cities and increased income for the contractors must eventually take place. Contractors who survive present losing prices will recoup themselves for losses on good pavements previously laid, or earn increased profits on excessive repairs when advertised for in connection with poor pavements of other contractors.

It is best to keep as many contractors as possible permanently in the field. This can be done only by having good specifications, giving the tests of materials and all requirements and compelling the work to be well done. The bids offered would soon be at reasonable but living prices. Combinations among contractors can be prevented or made of no avail by limiting the prices acceptable to the city, to those at which it is well-known that such work can be laid with an allowance of about 10 per cent. for contingencies and profits. A short time ago the head of the public works department of one of the largest cities said to me, "this city needs not cheaper but better asphalt pavements. Repairs absorb money needed for streets not yet paved with asphalt or other good pavement." I ventured to remark that he could compel the contractors to live up to the specifications and thus force them to bid living prices—the only basis for first-class work and subsequent economical maintenance. He should advocate the use of technical not political paving inspectors.

Companies often destroy their own future by laying poor asphalt pavements, thus forcing a city to adopt streets of other materials.

Men able to properly lay an asphalt pavement and having sufficient capital to obtain that which is needed can secure in the open market all the materials and machinery required, including several kinds of asphaltum good for paving. But they must remember that this mineral pitch is not the most expensive portion of the materials and work. Every detail must be well understood.

If I have sounded a note of warning to cities to look well to their specifications and to contractors to look well to their estimates, materials and work, this attempt may not be in vain.

ARTIFICIAL STONE PAVING.

By Warner H. Jenkins, C. E.

The following specification will be found suitable for laying artificial stone paving in most any locality, and of a superior quality:

1. The pavement and foundation will be twenty inches in thickness, as follows: The wearing surface, with concrete base, will be four inches in thickness, and perfectly homogeneous. The foundation will be sixteen (16) inches in depth.

2. The space over which the pavement is to be laid will be excavated to a depth of twenty inches below the top surface of the pavement when completed. Any objection-

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able or unsuitable material below the bed will be removed and the space properly filled and well rammed. This excavation will be filled with sharp, hard, clean cinders (preferred) or broken stone, thoroughly puddled, rammed and trimmed, so as to be exactly parallel to the surface of the finished pavement.

3. Upon the foundation thus prepared will be laid a concrete or base four inches in thickness, to be made as follows: One measure of imported Portland cement, subject to a prescribed test, will be incorporated with three measures of sharp sand, free from earthy or vegetable matter, in a dry state. After the sand and cement have been mixed by turning two times, it shall be passed through, by throwing against a standing sieve, and then made into a mortar with the least possible amount of water. Cubically broken hard stone, samples of fractured portions to be submitted, that will pass through a two and one-half inch and one and one-half inch ring respectively, thoroughly cleaned from dirt, drenched with water, containing no loose water in the heap, will then be incorporated immediately with the mortar in the proportion of two measures of the smaller and three measures of the largest stone. Each batch of concrete will be thoroughly mixed and evenly spread on the foundation, between well secured limits or mold guides and compacted by ramming until the total depth has been reduced one inch. This concrete, when compacted and in position, will be one inch at every point below the top surface. All cutting or jointing to be done immediately.

4. All mixed concrete, not in position, standing over one hour will be rejected. Concrete not topped the same day as when laid will be removed. All future materials must be transported on plans in order to protect the concrete.

5. Upon the concrete or base will be laid the wearing surface, or pavement proper, one inch in thickness, composed of the same or equal brand of cement as specified for the base, compounded with two measures of sharp, coarse, white sand, or finely crushed granite, free from flour and dust, preferred. These aggregates will be thoroughly mixed by turning two times and then being thrown through a standing sieve, and then wet to the consistency of a stiff mortar. This mortar will be evenly applied to the surface of the base or concrete, and rammed down solidly. After supplying the surface with additional mortar, occasioned by ramming, it shall be evenly and smoothly finished by troweling. When it is necessary to use a dryer, two parts cement, one part fine, sharp flint sand. This dryer, after dusting over the surface, shall be thoroughly floated in before finishing.

6. All joints shall be cut through to the corresponding joints in the concrete or base, and be well turned back to prevent chipping.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

QUALITY OF PIPE TO BE USED IN SEWERS.

Should 36-inch, "seconds," vitrified sewer pipe, be used in the construction of a sewer in a "combined" system?

A. Schnell, Clinton, Iowa.

Such pipe should certainly not be used unless definitely recommended by a competent and honest civil engineer who knew all the circumstances of the case. The best quality of pipe of this size is too uncertain in most soils when any weight

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of earth or of surface loads must come on it to make it entirely satisfactory. It is very doubtful if any engineer would recommend the use of any but the best if the local conditions led him to recommend pipe of this size. If the pipe mentioned has been recommended he should be able to give the best of reasons for his action.

HOW TO PREVENT FREEZING IN WATER-PIPE.

What can I do to prevent a ¾-inch galvanized water-pipe from freezing, it being only two feet under the surface of the ground?

T. F. Vanasek, New Prague, Minn.

If the pipe is laid on a uniform gradient so that all the water will run out of it you can drain it so that it will be empty when not in use. If you have not so laid the pipe it will freeze where the water stands in it. All the water can not be forced out by an air pump. Possibly brine would not freeze in the pipe, but probably it would in your climate. The safest and cheapest plan in the long run is to relay the pipe below the frost line. If the soil is favorable it will not be necessary to dig the whole trench. A few feet in length may be dug at intervals, and the pipe drawn through the ground from one section of trench to the next, a proper point being put on the end.

SLAG AS A FOUNDATION—DRAINAGE UNDER CURBS.

Our company proposes to do considerable paving and wish to know with what experience indicates that slag properly prepared, laid and compacted, will make as good a foundation for ordinary pavements as any material except concrete, or perhaps telford. The principal requirements are smoothness and uniformity of surface and thorough compacting. If streets are subject to heavy traffic, it is usually considered that concrete is preferble to any other foundation.

2. The local conditions will determine which form of sub-soil drain is preferable. Unless the soil is very light and of such a nature that it will fill up the spaces in the broken stone, that material will give the best satisfaction. Sometimes, where the soil is particularly heavy, both are necessary.

QUESTIONS AS TO PORTLAND CEMENT.

1. Can you put me on the track of any manufacturer of furnaces for making Portland cement clinker?

2. Do you know of any laboratory which, with other work, makes tests of Portland cement rock to determine its quality for Portland cement?

3. Is Spalding's book on cement the best and latest publication of the kind?

S. R. K., Jersey City, N. J.

1. The manufacturers of cement make their own designs for the necessary kilns and machinery. Almost any first-class foundry and machine shop will undertake the construction of the machinery from complete drawings furnished by the designers. There are several experts who will design such machinery and supervise its construc-

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and analyses of cement rock also.

3. Spalding's book on cement is the most complete of any American book on the subject. Cumming's American Cements is a later book, written with a strong bias in favor of natural cements.

INFORMATION ON MACADAM.

Can you refer us to some good treaties on macadamizing or some paper or article in MUNICIPAL ENGINEERING that will give information as to how macadam should be laid.

Lee & Sayre, Anderson, S. C.

"Road Making and Maintenance," two essays by Herschel and North; "A Text-book on Roads and Pavements," by Spalding; "Highway Construction," by Byrne; and other books, listed in our advertising columns, give full information on this subject.

Among articles on this subject in the columns of MUNICIPAL ENGINEERING will be found one by F. A. Dunham on thin macadam in April, 1897; one on requirements for telford macadam in June, 1896; an abstract of a discussion at a meeting of the Am. Soc. C. E. on road building in October, 1898.

SPECIFICATIONS FOR REFILLING TRENCHES.

Where can I obtain first-class city specifications for the refilling of trenches on streets paved or about to be paved?

H. M. Miles, Michigan City, Ind.

Doubtless the city engineers of Buffalo, Chicago, Indianapolis, the street commissioner of St. Louis, or the engineer commissioner of Washington, can supply you. Other cities have similar specifications. See page 162 of the September, 1898, number of MUNICIPAL ENGINEERING for some discussion of the subject.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

REPAIRS TO ASPHALT PAVEMENTS BY LUMP SUM OR BY THE SQUARE YARD?

We have lately received bids for repairs to almost 200,000 square yards of asphalt pavements in Scranton. As a member of the council, I think it best to accept a bid for these repairs made for a "lump sum" per year rather than have the repairs made by the square yard at a rate per square yard as ordered by the city from time to time or by the square yard computed over the whole area, whether repairs are needed or not. Only a portion of the pavement is now out of order, especially on streets where traffic is heavy or where poor pavements were laid. Elsewhere the repairs will be small. Do you favor the lump-sum system of paying for repairs? *X., Scranton, Pa.*

For Scranton the "lump sum" system for keeping all the streets named in the repair contract in constant good repair except in certain winter weather is the best method. It is also the cheapest method for the city budget, as well as one by means of which both city and contractors know exactly what is required.

When repairs are made as ordered from time to time and by the square yard, there arises an immense amount of detail work. Very few cities have sufficient engineering force to constantly inspect pavements, order repairs made at specified times and places, make the needed preliminary and subsequent measurements and records, etc.

The results are far more satisfactory to all concerned, and much unnecessary work and friction is avoided by compelling the contractors to keep in repair the asphalt pavements upon certain named streets, paying them a fixed sum per year for their work and holding them responsible for the entire surface under their maintenance contracts.

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BRICK AS A FOUNDATION FOR ASPHALT PAVEMENTS.

Having noticed the low prices of asphalt pavements all over the United States, I think that possibly a layer of ordinary brick could be used instead of concrete under the asphalt with as good results and at less cost. Do you know if this has been tried? I have seen brick pavements with a layer of other brick under them as a foundation. *S. E. M., Canton, Ohio.*

Such a plan was proposed in New Orleans last year but investigation showed that concrete, when laid properly, becomes one solid monolith over the street and makes a firmer and even cheaper foundation than even ordinary brick of the cheapest kind. Old and worn brick pavements are sometimes surfaced with asphalt pavement with excellent results and at about one-half the expense of taking up the old brick pavement and replacing it with one of asphalt or even a new brick pavement.

In Canton or elsewhere near large brick-kilns it is feasible to break up poor and rejected brick and use them in place of broken stone in compounding cement concrete for pavement and other foundations.

BY WAY OF COMMENT.

The Washington Meeting of A. S. M. I.

The American Society of Municipal Improvements is to be congratulated upon the success of the Washington meeting and upon the high character of the papers presented and of the discussions. City officials are certainly derelict in their duty who do not attend these meetings. There are three reasons for a failure to participate in such conventions which are of great weight with municipal authorities. The first and greatest is the fact that election or appointment to control of municipal work carries with it complete knowledge of all the materials, processes and results, so that the officials do not need to attend such conventions for their own benefit, and it is much better to have others come to see their work than to take the trouble to write out a description of it for presentation at a meeting. Try to get one of them to explain some process and the difficulties will be apparent.

Another very good reason is found in the demands of political life which leave no time nor strength for the development of proper plans for the work to be done. Not only do such officials fail to do good work, but they fail to have any interest in learning how to produce good results. If they attend a meeting or two, the entertainment features are the only ones of interest.

A third reason, which it should be easy to overcome, is the diffidence of really competent men to be heard in meetings with acknowledged experts. These are just the men whose experience in practical difficulties is of value to their brother officials of other cities. But it is not necessary to talk. Much can be learned by listening to others, though the best results can be attained only when each one

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gives from his own store of knowledge and experience as well as receives from the common store.

While the papers presented at this convention would be creditable to an engineer's convention, so far as matter is concerned, the manner of presentation was in nearly every case a happy combination of technical excellence with simplicity of form and language, so that both papers and discussions were thoroughly enjoyed by all. Many most valuable bits of information and reports of methods and results came from the non-technical members.

There was some feeling that the city officials did not attend in as large numbers as the value of the meeting warranted. The proportion of municipal engineers appearing on the program, and in the discussions was, therefore, proportionately large. No one could, or did, object to the valuable contributions of the engineers. In fact, the sentiment of all was voiced by one who said the engineers gave an example of unselfish devotion to the cause of good city government, by freely giving the results of their experience, which it would be well for the other city officials to follow. What was deprecated was the absence of such officials as mayors, members of city boards, and councilmen, especially of the smaller cities, who would derive the greatest benefit from the work of the society. tention of cities which have not yet attained to membership in the society. In all cities where the first two reasons for non-attendance do not apply, the knowledge of the work of the society should be sufficient to secure the membership of the city and its representation by a goodly number of its officials. The next meeting will be held at Toronto.

Forms of Municipal Reports. The special committee on municipal data of the A. S. M. I. made a report on forms of municipal reports, a part of which was printed in the November number of MUNICIPAL ENGINEERING. Forms for sewer, lighting and other reports are in preparation, and will appear in later numbers. The matter was referred to the executive committee, with the chairman of the committee on municipal data. That committee is desirous of securing all the criticisms and suggestions as to the forms presented that anyone may wish to offer, that the forms finally adopted may be as complete as possible. Our readers are requested to send such criticisms or suggestions to N. P. Lewis, president, Brooklyn, N. Y., or to Charles Carroll Brown, who was chairman of the special committee, Bloomington, Ill.

It is suggested that most of the forms for water-works reports have had the test of several years use, as

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by many members of that association and others. The schedules are enlarged in accordance with the evident necessities of water-works reports, as all those using the standard forms add tables and descriptions entering into fuller detail. It has seemed desirable to rearrange the items, in view of this extension of purpose.

The forms for street reports do not have the authority of adoption by any engineering body, but they are in use by the engineers of prominent cities.

Every item in the schedules is given in one or more reports by cities of high rank, but it is not possible that every item can be filled out by any one city.

Unbalanced Bids Prevented. A Jersey City delegate to the A. S. M. I. presented the method of bidding upon contracts in that city. It effectually prevents the evil of unbalanced bids. In the advertisement calling for bids the engineer for the city presents a maximum price for each unit of each material or kind of work. Bids higher than this maximum, under the terms of the advertisement, are informal and will not be considered. Contractors bid upon the items presented, giving the percentage of the estimated price at which they will do the work or furnish the materials. The maximum price, fixed by a technical expert in advance, presumably after careful examination of the ground, is thus known beforehand, and the peculiarities of unbalanced bids do not appear.

For example: A pipe sewer is to be constructed 1,628 feet long, of 30-inch pipe, 2¼ or 2½ inches thick, with an average cut of 12 feet, with 9-inch pipe for catch-basins, 6-inch Y's, 8 manholes and 9 catch-basins. The engineer fixes the maximum prices as follows: 30-inch pipe, 2¼ inches thick, $2.50 per foot; 2½ inches thick, $2.75 per foot; manholes, $60; catch-basins, $30, etc., etc.

The first contractor bids on each item in order, 90, 96½, 50, 66⅔ per cent. of the set price. The second contractor bids 90, 96½, 95½, 40 per cent. respectively. The first contractor, on the quantities stated, has bid lower on the whole work than the second and receives the contract.

The method is apparently successful in securing the desired result, preventing collusion, which would permit the unbalanced bid to be profitable, by definitely fixing the maximum price in the advertisement, where it can be discovered, if too large, in time to prevent serious results.

Louisville Filter Experiments. A consideration of the report by Mr. Geo. W. Fuller, the chemist in charge of the experiments on purification of Ohio river water by the Louisville Water Company, leads to the general conclusion that the method of treatment of water and the ultimate details of that method must be determined by actual experiment upon the water to be treated. General conclusions can be drawn, so that it may not be necessary to go through

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the whole round of experiments each time, but great care must be exercised in applying these general conclusions to each case. Thus it is probably settled by the results of these experiments that the proper procedure for waters similar to the Ohio river is: first, subsidence or sedimentation; second, coagulation, doubtless with sulphate of alumina, in quantities to be determined almost from hour to hour; and, third, filtration. In regard to the last process, the results seem to show rather the methods that are not successful and to some extent the reasons for their complete or partial failure.

More detailed notice of the experiments will be made hereafter, it being the intention here to call attention to the general conclusions. When we have the results of the Cincinnati experiments also under Mr. Fuller's direction, and of the Pittsburg experiments under Mr. Hazen, we will have quite full knowledge of the Ohio river. It is very doubtful whether the methods here developed would be applicable in full detail even to another sedimentary river such as the Missouri.

The problem on such rivers as the Hudson at Albany is simpler on account of the difference in amount and character of the suspended matter. Albany is constructing its filter plant without elaborate experiments. It will be interesting to see whether, for this class of river, this is a safe mode of procedure. The operation of the filters for a year or two will demonstrate what modifications, if any, are necessary. Albany has, however, the experience of Poughkeepsie and to some extent of Hudson as guides. The river water is not greatly different at the lower points, except that it has had opportunity to drop a measurable amount of its sediment, especially during sediment-bearing floods.

Indefinite Plans and Specifications.

The demands of city councilmen and other similar officials for immediate presentation of plans for extensive works lead to indefiniteness of plans which later may give rise to much trouble and expense. When the fact that the plans and estimates are approximate happens to be understood by the council, and is made a pretext for changes by that non-expert body, still further complications arise.

The courts usually hold to the common principle of honesty that work properly done, without suspicion of fraud in securing or carrying out the contract, must be paid for, and the city must usually pay good prices for the work and the costs of suits, attorney's fees, and so forth, in addition.

A recent example is that of Salt Lake City, which let contracts to construct water-works according to plans and specifications, which were not complete, lacking even surveys of part of the proposed work. The city proceeded on the assumption that, under the terms of advertisement and contract, the contractors could be required to

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construct what was desired in the location fixed by surveys made after the contract was executed, at the price bid. One of the contractors was able to show that an approximate location differing materially from that finally adopted, and requiring more work and material than the estimate presented with the specifications, had been indicated to him as that probably to be made. He has recently secured a decision from the United States circuit court favorable to his claim for extra compensation, the decision being directly in line with many previous decisions in other courts upon similar cases.

The action of the city council in Philadelphia in demanding practical impossibilities of its engineers, in preparing plans for a new reservoir, is the first step in a similar train, which may have more serious consequences if the matter is not more carefully conducted hereafter.

The demands of the legislature of the state of New York upon the state engineer's office, coupled with the scaling down of even these approximate figures, without conference with the engineers or with other experts, has led to very serious consequences in the matter of the reconstruction of the Erie canal, dent, which is reported to have occurred on certain state work, may be given. The assistant engineer in charge of the work proposed to improve a certain culvert, and made a sketch of the work to be done, almost without a measurement, and with little knowledge of the actual conditions in the concealed portion of the work. He sent it to the office of the chief engineer, with the suggestion that the reconstruction of the culvert be authorized. An estimate of quantities accompanied the sketch, as required in such cases, but it was expected that the plans would be returned for elaboration. However, the chief engineer's office not only approved the project, but advertised for bids and let the contract. A comparison of the final estimate with the original estimate shows the deficiencies of the latter, the two having scarcely anything in common. There being itemized bids for most of the extras, there was an opportunity to settle the matter without resort to the courts, but the payments to the contractor were materially larger than the original estimate, and final settlement could only be secured by mutual concessions, which were fortunately easy to secure.

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boards to modify plans without asking the necessary advice. If engineers could refuse to be so overcrowded, much trouble would be saved. There are but few who have the necessary obstinacy or influence.

Erie Canal Management.

So far as the management of the Erie canal enlargement could be considered an issue in the recent state election in New York, the present management has received a "vindication." There were many other issues, however, and this one was not so all-important that this interpretation of the result can be accepted without question.

The expert commission reported in July many circumstances which indicated incompetence in some of those connected with the work, and dishonesty in others, with a general flavor of indifference to the work and a tendency of each official to shift responsibility to others. The commission, being appointed to ascertain the actual occurrences, had not powers sufficient to enable it to fix responsibility, and so its findings are subject to revision when all the facts and the controlling requirements are brought out. The replies to the report of the commission, by state engineer and superintendent of public works, are therefore very pertinent documents, and are entitled to as much consideration as the report of the commission, though made, of course, by parties directly interested in the work.

Some little familiarity with the work during its progress, together with the report and replies mentioned, lead to the conclusion that there was little attempt to develop the actual facts during the campaign, but that the occurrences were manipulated almost wholly for political purposes. Now that the election is over conclusions by a disinterested observer may perhaps receive passing attention.

The first fact observed was the short time between the request for estimates and the presentation of those estimates to the Constitutional Convention. The reason for this is shown in the report by the state engineer and his statement to the convention that his estimate of about $12,000,000 was little more than a guess should have made the convention cautious. That body seems to have assumed, however, that the guess was too large and to have scaled down the amount to be asked of the voters and fixed it at $9,000,000 on grounds of expediency only. The attempt has been made to place the responsibility for this upon the state engineer, just as it is made in many similar instances where the guess or estimate of the expert is revised by the politician and fixed for his own purposes without reference to or even knowledge of the actual necessities of the case. This is only a large sized blunder of a very common sort, for which the engineers can in no sense be held responsible.

The second step was the making of surveys and more detailed esti-

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mates, which, not yet complete, showed a probable cost of about $15,000,000, a sum which, at the command of the canal committee under the law, was scaled down by omitting everything possible, in a futile attempt to work within the sum voted. The engineers may doubtless be blamed for cutting short the surveys on account of popular clamor against their expense. Few engineers have the strength to carry out what they consider to be actually essential work under such circumstances. The State Engineer was no exception to the rule. The engineers on the work were of all grades, as they are likely to be on large undertakings. It was quite difficult to secure men of experience for the salaries paid in the subordinate positions. Any one familiar with New York politics thinks he has good reasons for the belief that many men in all grades of positions secured their places largely through their political influence. It seems to be inevitable on public work to receive less service for the same amount of money than in private work.

All these difficulties brought about a feeling of indefiniteness in regard to quantities and character of work which led to such criticisms as that made of the specifications by the consulting engineers of the investigating commission, who objected to the division of the bids into so many separate items. Any other procedure under the circumstances, would have led to endless controversies with contractors and the apparent cost of contracts at the beginning would have been increased so that the final cost would not have been materially different. The final catastrophe would probably have occurred a little earlier than it did. The State Engineer makes a good defense on this point. The engineers may rightfully receive adverse criticism for not refusing to present plans unless they were as complete as they could be made after adequate surveys and examinations were made.

From the beginning there seems to have been no idea that the sum appropriated would complete any very large part of the work. The only effort was to leave the canal in the best shape possible when the appropriation was exhausted. There has undoubtedly been some money expended for work of engineers and on contracts which could have been saved under a better system of managing such expenditures. The system is one which has developed through many years. Because the men in charge of the work were unable to revise the system to meet the new conditions in the short time allotted and with so many lines of work to manage is hardly their fault. It is not probable that any one could have been found who would undertake such a work under the existing conditions.

The questions involving the honesty of the state employes will not be touched. No actual dishonesty has yet been proved. Looseness of

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methods and carelessness are not dishonesty in the ordinary sense of the term, though they leave the door open for dishonesty in others.

The whole affair is a serious arraignment of American political methods of conducting public works even under civil service rules, when those rules can be practically nullified by the politicians so readily as on New York state work.

PERSONAL INFORMATION.

WARING—Col. Geo. E. Waring, jr., died of yellow fever in New York on Oct. 29. He had just returned from Havana, where he had gone by appointment of President McKinley to select camp sites in Cuba for United States soldiers and to arrange for sanitary improvements there. In the performance of this duty he contracted the disease. He fell ill immediately on his arrival in New York, and the disease quickly developed in its most malignant form, resulting in death. Within four hours afterward the remains were cremated. Col. Waring has been one of the prominent figures of the country, and was the most widely known leader in municipal sanitary work. He was born in Providence, N. Y., on July 4, 1833, and was educated at College Hill, Poughkeepsie. He studied engineering and also took a special course with the late Prof. James J. Mapes in agricultural chemistry. He displayed a special aptitude for this science. When but twenty-one years old he made a lecture tour through Vermont and Maine, talking upon agricultural topics. Shortly afterward Horace Greeley became interested in his work and employed him to manage his farm in Chappaqua, N. Y. This was in 1855. Two years later he was appointed agricultural and drainage engineer of Central park. He designed the present system of drainage of the park and incidentally planted the two rows of noble elms on the Mall. He was in this office when the civil war broke out. He dropped his work immediately to go to the front. He went out as major of the Garibaldi Hussars. After three months' service he was transferred to the Department of the Southwest. He was a major of cavalry under Gen. John C. Fremont, and raised six companies of cavalry in St. Louis, which were called the Fremont Hussars. These afterward formed, with the Benton Hussars, the Fourth Missouri cavalry. Maj. Waring was made a colonel in recognition of these services, and served in that capacity during the remainder of the war.

He became manager of the Ogden farm in 1867 and took up his residence in Newport, R. I. This farm was a sort of school for scientific farming. Col. Waring continued his studies in engineering, developing them along the lines of sewerage systems.

It seems the irony of fate that Col. Waring should have died of the very disease the successful combating of which gave him national fame. When the terrible epidemic of yellow fever broke out in Memphis in 1878 Col. Waring was summoned to the city, and revolutionized the sewerage system of the place. Because of the peculiar topography of the city, he found his task a difficult one. He introduced there the system by which the house drainage and the surface drainage were disposed of separately. It was called the Waring system. By reason of this work he became widely known. His system was adopted in many American and some European cities.

He was appointed a special agent of the tenth census in charge of the social statistics of cities. He afterward became a member of the National Health Board.

Col. Waring again came into prominence when Mayor Strong appointed him street cleaning commissioner of New York. From the very beginning he assumed an aggressive conduct of his department.

The colonel conducted his department in a strictly non-partisan manner, and he conducted it well. The streets were what they had never been before—clean. Under his predecessors it had been the custom to clean a few leading thoroughfares, where a good showing was made, and to leave the rest of the streets almost untouched. Waring cleaned all the streets. One of his first acts was to uniform his men in white duck suits, to thoroughly organize them and establish among them a certain esprit de corps. Every year the street cleaners paraded, and a fine showing they made. Col. Waring made a brisk crusade against the truckmen who were accustomed to store their wagons in the

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street, thereby blocking the thoroughfares and increasing the difficulty of cleaning them. The truckmen raised a great howl about this crusade, but the commissioner went right ahead and rid the city of the nuisance. He organized children's clubs, the purpose of which was to aid in promoting the cleanliness and health of the city. These children reported such cases as came under their observation of persons throwing rubbish in the streets and did a good work.

As a memorial to Col. George E. Waring, an endowment fund of $100,000 will be raised with which to establish in Columbia College the Waring Chair of Municipal Affairs. The amount will be raised by subscription and during her lifetime the income from the fund will be paid to Mrs. Waring.

LEWIS—The American Society of Municipal Improvements made a fortunate choice in the election of Mr. Nelson P. Lewis, C. E., as its president for the ensuing year. A recent portrait of Mr. Lewis appears in this number of Municipal Engineering. His connection with the city works department in Brooklyn began about fourteen years ago, when he was employed for service on the aqueduct extension after a successful civil service examination. He resigned after two years, however, on account of the slow progress of the work. He then located at Birmingham, Ala., and assisted in the building of a railroad and for a time he was engaged in engineering work at Savannah, Ga. In 1889 Mr. Van Brunt Bergen, the chief engineer of Brooklyn, asked him to return to that city and resume his connection with the city works department. He accepted the position offered him and was given charge of various important engineering projects. He was in charge of the bureau of local improvements under Commissioner White, and was afterward made engineer of street construction and maintenance. He is now in charge of the bureau of highways in the borough of Brooklyn. He has been one of the most valuable members of the American Society of Municipal Improvements, and, as its president, will, it is expected, extend its usefulness. He is a member of the American Society of Civil Engineers and is a graduate of the Rensselaer Polytechnic Institute.

Personal.

Geo. W. Carey has been elected water superintendent at Media, Pa.

A. S. Parker has been confirmed as city engineer of Ogden, Utah.

W. M. Davis, town engineer of Woodstock, Conn., has been appointed town engineer of Berlin, Ont.

DeWitt C. Cregier, ex-city engineer and ex-mayor of Chicago, Ill., died Nov. 9.

E. Sherman Gould, M. Am. Soc. C. E., Yonkers, N. Y., has returned from Cuba.

John M. Farley has been appointed engineer of the water works system of White Plains, N. Y.

John Gault of Toronto has been elected city engineer at Ottawa, Ont., to succeed Robert Surtees.

John J. Steele has been elected superintendent and treasurer of the water works at Mexico, Mo.

Robert Shaw of Pittsburg, Pa., has been elected engineer of the water works at Grove City, Pa.

F. G. Powers has been elected superintendent of the Alexandria Water company, Alexandria, Va.

R. C. Gemmell, M. Am. Soc. C. E., Salt Lake City, Utah, has been appointed state engineer of Utah.

John H. Richardson and William McDougall have been elected water commissioners at Gloversville, N. Y.

The Hon. P. P Mast, ex-mayor of Springfield, O., died Nov. 21, after a lingering illness of several months.

Robert Whittet has resigned his position as a member of the board of public improvements at Richmond, Va.

Abram Wing has resigned his position as superintendent of the City Water Supply company, Ottumwa, Ia.

Clarence Goldsmith, Andover, Mass., has been appointed superintendent of water works at North Adams, Mass.

Lawrence F. Lewis has resigned his position as city commissioner in charge of streets and sewers in Baltimore, Md.

Elias Giesering, sewer contractor, was killed at Marquette, Mich., Nov. 3 by the caving of the walls of a sewer trench.

Edward N. Sampson has been appointed engineer of the consolidated sewer, water and highway department, Andover, Mass.

Sr. Manuel Torres Toriga, city engineer of Mexico, Mex., is visiting Chicago for the purpose of studying municipal improvement.

Mr. Amzi L. Barber, president of the New Trinidad Asphalt Co., Ltd., New York, is taking a pleasure trip along the Pacific coast.

Brig.-Gen. Thomas L. Rosser has been offered the position of sanitary inspector for Cuba, to succeed Col. George E. Waring, deceased.

C. F. Loweth, M. Am. Soc. C. E., St. Paul, Minn., has been engaged to prepare plans for railway bridges for the Chinese government

C. A. Spencer of Philadelphia, Pa., succeeds George W Saxon, resigned, as manager of the water works and gas companies at Tallahassee, Fla.

Clay C. Cooper, assistant managing editor of the Journal, Detroit, Mich., has resigned to accept a position with the Michigan Portland Cement company.

Willis Chipman has been recommended by the board of public works at Ottawa, Ont., for appointment as city engineer to succeed Robert Surtees.

Otto Dyckerhoff, C. E., a son of Gustav Dyckerhoff of the German Portland cement firm, is visiting in the United States, and while here will examine a number of large manufacturing concerns, including Portland cement manufacturing plants.

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Edward M. Garnar, sr., of Luzerne, N. Y., died at Hadley, N. Y., Nov. 2. Mr. Garner was builder and proprietor of the water works supplying Luzerne and Hadley.

Julius Schubert, C. E., died in Brooklyn, N. Y., recently, aged 60 years. For many years Mr. Schubert has devoted most of his time to asphalt and asphalt pavements.

W. H. Pratt, formerly receiver and manager of the Mt. Vernon Bridge company, Mt. Vernon, O., has been appointed manager of the Universal Construction company, Chicago.

Robert G. Smith, a member of the street and water board, Jersey City, N. J., has resigned his position as colonel of the Fourth regiment to devote attention to his official and private business.

C. M. Setterwall, iron manufacturer of Sweden, is visiting Pittsburg, Pa., for the purpose of studying American methods and comparing the relative cost of the production of iron and steel in the two countries. N. Lilienborg, his New York agent, accompanies Mr. Setterwall, and their headquarters are at present at the Monongahela, Pittsburg.

Nicholas Turnbull, A. M. Inst. C. E., of the firm of Richard, Johnson & Nephew, Manchester, England, is visiting in the United States for the purpose of inspecting American manufacturing plants.

Edward Candlot, Paris, France, director of the Compagnie Parisienne des Cements Portlands at Nantes, is visiting in the United States. While here he will visit a number of principal cement works.

Frank Cofrode has been appointed superintendent of bridges in the bureau of highways of Philadelphia, to succeed the late Carl A. Trik. Mr. Cofrode was formerly a member of the firm of Cofrode & Saylor, iron founders and bridge builders.

Frederic P. Stearns, chief engineer of the Metropolitan water board, Boston, Mass., lectured before the Society of Arts Nov. 10 on "The Metropolitan Water Supply." Prof. W. O. Crosby will present a paper on "The Geology of the Wachusett Reservoir" at the next meeting of the society, Dec. 8.

CURRENT INFORMATION.

A French Engineer on the Philadelphia Water Problem.

The pure water question of Philadelphia is being studied by P. A. Maignen, a French engineer. He says a filter plant can be built for Philadelphia, which will possess all the good qualities and none of the disadvantages of the Anglo-American system, which will utilize land already owned by the city near the reservoirs, without the purchase of another foot, which will be kept within the $3,000,000 provided, and during the construction there will not be a stoppage of the water supply for a single hour to any part of the city. He has prepared complete plans covering the five reservoirs, which Chief Trautwine says will be sufficient to supply the city—East Park, Roxborough, Queen Lane, Belmont and Frankford—and will submit them to the department of public works. He estimates that the cost of construction of the filters will not exceed $10,000 per million gallons, with covered beds which can be cleaned at any time. These beds will be in sections, 16x100 feet, with two foot pathways between each so that workmen will have ample room in which to work in cleaning the surface of the sand. Mr. Maignen has not figured upon the cost of maintenance, but thinks it will be no more than the old sand filtration system in use in Europe.

City's Right to Test Water Works Sustained.

Judge Seaman of the United States court handed down a decision Nov. 16 in the case of the Racine Water company vs. the city of Racine, Wis. The suit was the outcome of an application on the part of the plaintiff to enjoin the city from holding any test of the water works as ordered by the city July 28, 1898, and further, to restrain the extension and use of the present system of flushing tanks employed by the city in flushing sewers. The plaintiffs contended that the provisions of its franchise for a test refers only to the first or initial test of the water works prior to their acceptance, and that the city had no right to require similar tests under the clause authorizing it to call for subsequent annual tests. Judge Seaman holds this erroneous and sustains the right of the city to require such extreme tests annually. Whether this constitutes a test beyond practical needs, as the bills and supporting affidavits assert, or is clearly within such needs as asserted on behalf of the city, is not open to consideration. The franchise was accepted with this condition attached, and the city is entitled to the benefits of the test prescribed, either as a factor of safety or otherwise provided, of course, that the conditions exist under which the test may be called for.

An Instance of the Danger in Using Well Water.

The danger of the contamination of wells by sewage, even in sparcely settled districts, was illustrated by Dr. Stokes recently at a meeting of the Maryland board of health. He said that on last Fourth of July the water works machinery of a Maryland town of

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300 people broke down and for one day water from an old well was used. Ten days later there was an outbreak of inflammatory intestinal disorders and three cases of typhoid fever resulted. The water was tested and found to contain 4,100 bacilli in a cubic centimeter—about fifteen drops. The regular water supply contained 80 bacilli in a centimeter. Dr. Charles L. Mattfeldt, a member of the board, expressed the belief that 90 per cent. of all water taken from dug wells is contaminated more or less by sewage.

The Albany Filtration Beds.

The work of constructing the filtration beds, to supply pure water to Albany, N. Y., is about completed. The work is being done by T. Henry Dumary and Wilson & Baillie, contractors of Albany. The purification plant includes a low-lift pumping station, drawing water from the Hudson river; a sedimentation basin, capable of holding 16,000,000 gallons; eight covered filter beds, each 0.7 acre in area, with a combined capacity of 15,000,000 gallons, and a 600,000-gallon covered pure water basin. The bottom of the sedimentation basin is composed of 16 inches of puddle, then 2 feet of broken stone, and then 10 inches of stone paving. The floors and roofs of the filter beds and clear water basin are of concrete, and the walls of the filter compartments and the piers of the compartment are of brick. The concrete is composed of approximately 1 part of cement, 3 parts sand and 5 parts gravel, the proportions being slightly changed as occasion demands. The filtered water is to be delivered to the present main pumping plant at Montgomery-st. through a 48-inch riveted steel conduit 8,000 feet long, and encased in concrete.

Taxes on Suburban Property of Municipal Water Works.

The city of Rochester, N. Y., is preparing to pay the taxation levied against water works property by suburban towns. This action is taken as a consequence of the recent decision of the court of appeals, in which it was held that the city must pay taxes on such property. The towns in which the city owns property devoted to water and on this valuation taxes are now due for 1897 and 1898. It has always been held that property used for this purpose, wherever located, was not assessable, but certain changes were made in the state tax laws in 1896, and among them was one which was construed as making such taxation permissible. Previous attempts to tax the water works property in different towns had all been defeated, and the city, believing that the legislature had not intended to make such a radical change in the law, decided to fight the case. The town assessors, encouraged by the law of 1896, decided to levy the taxes. Corporation Counsel Rodenbeck appeared personally before each of the town board of assessors and urged against the assessments, but to no purpose, and the suits were begun. The action of the town of Livonia was made a test case, and when the court of appeals decided against the city of Rochester it was decided that to fight the other cases, which were identical, was useless. The proposed action of the tax officials of these towns was given in the September, 1897, number of Municipal Engineering.

Proposed New Water Rates in Milwaukee.

Uniform water rates have been decided upon in Milwaukee, and it is thought that a new flat rate schedule will go into effect Jan. 1, 1899. A resolution has been presented by Mayor Rose providing for an annual charge of $1 for each meter reading, the money to be paid in quarterly installments when the water rates are paid.

Lease of the Uintah Reservation.

A syndicate has leased, for ten years, a part of the Uintah reservation containing in all fully 300,000 acres. The lease is signed by about thirty of the head men of the Uintah and White river tribes. It provides for a royalty of 15 per cent. on all elaterite, woertzelite, asphaltum, gilsonite and mineral wax mined. The royalty is fixed at 15 per cent. but shall never fall below $4.50 per ton, the market price to be fixed in the discretion of the secretary of the interior at Chicago, St. Louis, Kansas City of New York. The

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Senator Joseph R. Rawlins, who secured the passage of the act opening the Uintah reservation, as a rider to the Indian appropriation bill, opposes the lease and has appealed to Secretary Bliss to defeat it, as he believes it to be contrary to public interests.

Opposed to Municipal Asphalt Plants.

E. P. North, formerly consulting engineer and in charge of paving in New York under Mayor Strong, previous to the present Tammany administration, expresses the opinion that it would be a poor plan to have an asphalt paving plant owned by a city. He says the pressure from persons having financial or political influence for employment and the employment of "asphalt cranks" who could pass civil service examinations would make it very doubtful if a city could get good asphalt pavements. New York provides for good asphalt pavements by strict and complete specifications with maintenance and repair clauses, covering five, ten and fifteen years. The city is able to have its specifications enforced so well that the surface of New York asphalt pavements, he says, is generally better than in London or Paris.

A Chicago Decision Affecting Paving Contracts.

All the pending ordinances for brick street paving in Chicago were rendered invalid by a recent decision of the county court, when Judge Hodson held that the provision of the ordinances requiring the pavement to meet "a test satisfactory to the board of local improvements" gave the board too much discretionary power, and was, for that reason, unlawful.

Cost of Paving and Street Cleaning in Detroit.

Statistics have been prepared under the direction of Public Works Commissioner Kallman showing the comparative prices of paving and street cleaning in Detroit in 1889 and 1898. In 1889 cedar on plank cost $1.23, and asphalt $2.66 a square yard, and during 1898 cedar on concrete cost $1.29 and asphalt $1.80. With cedar on plank principally used for paving in 1889 it cost the city $55,990 to clean 133 miles of paved streets, while in 1897 it cost the city $68,660 for cleaning 248 miles of paved streets.

Opposed to Retaining Money Due Contractors.

The special committee appointed to consider the question of changing the terms of paying for paving in Buffalo, N. Y., held a meeting to discuss the matter Nov. 11. The committee, which is composed of Councilmen Adam, Ash and Boeckel, decided to report in favor of adopting the resolution to abolish the present plan of retaining 10 per cent. of the contract price until the term of the guarantee expires. The committee is unanimous in its views on the subject. It believes it is a good business policy to pay the contractors their full contract price without holding any back, owing to a tendency on the part of contractors, if they know that a percentage is to be withheld from them, to enlarge their bids so as to cover the percentage withheld, or at least to cover the interest on the money withheld.

Special Assessments for Paving in Iowa.

The Iowa supreme court rendered a decision relative to special assessments for paving, in which it held that under the constitution of Iowa, when a tract of land has been platted into lots, the platted boundary lines must control in determining paving assessments; that any assessment must be limited to the lot or parcel of ground which abuts on the paved street, however small, without regard to the use made of it, and no subdivision which does not actually abut on the street improved can rightfully be assessed for the improvement. Judge Robinson, who wrote the opinion for the majority of the court, adds a dissenting opinion for himself. The court's decision was in the case of L. W. Smith and others against the city of Des Moines to enjoin the collection of special assessments for grading and paving.

A Plan to Abolish Grade Crossings in Syracuse.

A plan for the abolition of grade crossings in Syracuse, N. Y., has been outlined in a communication to Mayor McGuire by W. R. Hill, superintendent of the water department. The plan provides for the removal of all railroad tracks and crossings from the central part of the city, and to send all trains about the city to the north, following the line of the present freight trains. From this line would be constructed a branch to a union station at the head of N. West-st., utilizing land which, at present, is put to no more important use than as a place for old salt vats. This land would furnish ample space for freight yards and tracks. The adoption of the plan would mean the abolishing of all grade crossings of these railroads, both in the city and in the village of Solvay, which must, in time, become a part of Syracuse. Mayor McGuire believes the plan

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has the merit of economy and that it would be very likely to meet the favor of the railroad corporations.

Asphaltum in Indiana.

A bed of asphaltum has been found on the farm of Charles B. Longwell, near Logansport, Ind., which State Geologist Blatchley pronounces of high grade and pure quality. While drilling a gas well, Oct. 26, through what was thought to be limestone, the men struck, at a depth of 85 feet, a soft, yielding substance resembling tar. A quantity was sent to the state geologist for examination, who pronounced it asphaltum. The extent of the bed will be tested in order to demonstrate whether the deposit is in sufficient quantities to warrant mining.

Proposed State Municipal League in Indiana.

The city council of Richmond, Ind., is inviting other cities in Indiana to join in a municpal league for the purpose of getting state legislation this winter. Attention is called to the fact that, with three exceptions, the cities are operating under charters based on the law of 1850.

Towns Must Keep Their Bridges in Repair.

The supreme court of Ohio rendered a decision, Nov. 4, regarding bridges in towns and cities, in which it states that the cities must keep bridges over natural streams and water courses within their limits in repair, or be prepared to pay damages for injuries received through such neglect. Because a bridge in a town is built by the county commissioners affords no reason why the town should not keep the bridge in repair.

Regulating the Use of Sidewalks and Parking.

Under authority of congress the district commissioners at Washington, D. C., have made regulations granting the use of parking and sidewalk space to business men on certain streets as follows:

1. Applications for permission to use portions of the sidewalks and parkings on business streets shall be addressed to the commissioners of the District of Columbia, stating the space desired and the nature of the business conducted.

2. Permits will not be transferable, nor can persons to whom such permits are issued sublet the privilege, nor will permits be issued excepting on the condition that the parties to whom they are issued will

3. It shall be unlawful to place or pile lumber higher than sixteen feet on any parked space used under these regulations.

4. Any person or persons violating any of the foregoing regulations shall forfeit the privilege of occupying the sidewalk or parking space assigned to him or them, and his or their license issued under these regulations shall be revoked; and whenever such license is revoked for the violation of any of the regulations it shall be the duty of the person or persons whose license has been revoked to remove everything which has been placed on the sidewalk or parking by him or them within three days from notice, and restore the sidewalk or parking to the condition in which it was when the license was granted. And that all permits to occupy sidewalk or parking under these regulations shall be subject to revocation by the commissioners on thirty days' notice, whenever in their opinion the public interest requires it.

St. Louis Objects to Chicago Sewage.

A committee was appointed by Mayor Zeigenheim of St. Louis, Nov. 12, to investigate the Chicago drainage canal, with a view of taking measures to prevent the emptying of Chicago sewage into the Mississippi river, or to compel Chicago to fulfill the conditions under which the canal was built. The committee is as follows: R. E. McMath, president board of public improvements; B. H. Colby, sewer commissioner; M. L. Holman, water commissioner; Dr. M. C. Starkoff, health commissioner; Hon. Henry T. Haarstick, Merchants' Exchange; Hon. W. A. Kavanaugh, Business Men's league; Hon. W. C. Wetmore, Manufacturers' Association; Hon. Julius Lesser, Cotton Exchange; Hon. E. C. Rowse, Real Estate Exchange.

Alleged Defective Work of Tunnel Contractors in Chicago.

Fraud in the construction of section 3 of the northwest land tunnel is charged by the city of Chicago in its answer to an injunction issued by Judge Smith, restraining the city from forfeiting the contract of Weir & McKechney. The answer of the municipality declares that section 3 of the land tunnel is in a most dangerous condition, and that the lives of citizens are in peril and that unless speedy action is taken the tunnel system will be rendered useless; that the Weir-McKechney branch of the tunnel is half filled with water; that a great hole under the big lake at Humboldt park, unsupported by masonry of any kind, daily threatens to cave in and thereby flood the

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are based on affidavits from civil engineers, who claim that the contractors have defrauded the city of thousands of dollars, and by alleged negligence and disregard of contractual liabilities threaten the practical destruction of the entire northwestern land tunnel and a loss to the city of $3,000,000. The engineers who made these examinations are City Engineer Ericson, T. T. Johnson of the drainage board, R. B. Wilcox, W. D. Barber, George F. Samuels, Paul Brown, Assistant City Engineer Barnes, Assistant City Engineer Spangler; ex-Assistant City Engineer Jackson, Frank Holmes, Engineer Aronstein.

The circumstances leading to the present trouble extend back to Oct. 19, 1895, when the contractors became dissatisfied with the arrangements of the contract, which was awarded under the Swift administration. and the case was carried to the supreme court. Later, Mayor Swift and Commissioner of Public Works Downey, in direct violation of the supreme court decision, entered into a compact with the contractors which took the form of a supplementary contract and finally ripened into contract by ratification at a meeting of the council.

Weir & McKechney assert that they have lived up to the specifications in their contract, and will make a bitter fight against the city in the courts. They give assurance that an inspection of their work by Gen. Sooy Smith and other experts will prove that the city's contention is not well taken.

The Good Roads Movement.

To the Editor of Municipal Engineering:

I send you a copy of the Minneapolis Times of the 23d inst., containing my review of Mr. Beatty's excellent article in Municipal Engineering on "Practical Legislation for Good Roads." I believe Mr. B. is laboring under a wrong impression in the matter of the country wasting its energies in seeking to attain the impossible (so styled by him), good roads—i. e., stone roads,. To leave such statements uncorrected, to my mind, is not to help the cause. Yours very truly,

W. R. HOAG.

Minneapolis, Minn., Oct. 28.

Mr. Hoag's article in the Minneapolis Times is longer than space will permit us to reproduce in full. In it he says that, with the general sentiments expressed in Mr. Beatty's article, "every good roads advocate heartily agrees; but to that part claiming that the general movement has been directed to securing stone roads we enter an exception as far as Minneapolis contributes to the general movement. At the three good roads conventions held in this state since the organization of the movement in this state we have had papers read bearing on many phases of the question, but we do not recall a paper on stone roads. There is not at present, nor has there been in Minneapolis, a serious agitation in favor of macadamized roads. We all feel that our distances are too great at present, and stone is too expensive a material to be used for road building. We believe that stone will be used in the near future for roads near the towns and cities of the state, but it will be many years before the settlement of the farming district will warrant the expense of macadamizing even the main highways."

Referring to Mr. Beatty's statement suggesting that state aid is a mistake, Mr. Hoag says: "Instead of it being an erroneous theory, it is just the plan which is being followed by those states where the only systematic road building in this country is being done and doubtless the same to which the author alludes when he observes that 'much has been done in some few parts of the country,' etc. England, as well as most of the European countries, enjoyed the same full local control of her highways about a hundred years ago and she likewise has roads not much better than those we boast at present and would have had them still but for the central control which she then adopted. Every country in Europe today having good roads has in effect the plan of mild central control—all under the cash contract system, and under engineering supervision."

Official Salaries in Assignments.

A series of cases were recently decided by Judge Munson, of Zanesville, O., in which L. H. Williams, E. R. Jones and A. O. Jones, officers and directors of the A. O. Jones Terra Cotta company, sued F. H. Southard, assignor of that company, to recover so much of their salaries as had accrued before the assignment and remained unpaid. Their claim was based upon the statute giving operatives a first lien upon the assets in the hands of the assignor, and it was shown that each of the officers, as a part of his duties, performed certain manual labor. The court held that this did not, under the circumstances, entitle them to preference, as they were primarily officers of the corporation and not, within the meaning of the law, operatives.

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Technical Meetings.

At the meeting of the Western Society of Engineers, Nov. 2, a paper on "The Construction of Retaining Walls for the Sanitary District of Chicago" was presented by James W. Beardsley.

A regular meeting of the Franklin Institute was held at Philadelphia, Nov. 8, William A. Rosenbaum read a paper on "The Status of Electrical Invention."

The Engineers' club of St. Louis held its 478th meeting, Nov. 2. Capt. T. H. Macklind delivered an address upon "Roads and Roadways," in which he pointed out the necessity of good roads to our present civilization, and showed how city streets had developed from country roads. The value of various pavements from different standpoints, and the methods used and the art of cleaning the streets in the different cities were discussed in the paper.

The annual convention of the Florida Good Roads association was held at Jacksonville, Fla., Nov. 23.

The regular meeting of the Engineers' Society of Western Pennsylvania was held at Pittsburg, Pa., Nov. 15. Dr. R. G. R. Moldenke read a paper on "Cast Iron."

At the meeting of the Engineers' club, of Columbus, O., Nov. 5, F. Herbert Snow, Assoc. M. Am. Soc. C. E., of Boston, Mass., delivered an address on the system of sewer assessments recently established in Boston and Brockton.

The New Jersey Sanitary association will hold its twenty-fourth annual meeting at Lakewood, N. J., Dec. 9 and 10. Some of the papers to be read are: "The Powers, Duties and Limitations of Boards of Health," Samuel A. Patterson, Asbury Park; "Methods of Sewage Disposal," Rudolph Hering, New York City; "Public Water Supplies and the Preservation of the Pollution of the Same," James H. Fuertes, New York City.

The Boston Society of Civil Engineers celebrated the fiftieth anniversary of its organization, Nov. 11. President Howard A. Carson delivered a lecture of "Glimpses of Boston Fifty Years Ago." Desmond FitzGerald W. F. Foster; first vice-president, W. M. Leftwich, jr.; second vice-president, E. E. Betts; secretary and treasurer, H. M. Jones; directors, H. McDonald, J. S. Walker and C. B. Wilson.

The Louisiana Engineering Society on Nov. 5 took a tour of inspection of the points of especial engineering interest in the vicinity of New Orleans, which included trips to the various canals and pumping stations connected with the new drainage system which is being installed in New Orleans.

A new section, to be known as the "Mechanical and Engineering Section," has recently been formed for the consideration of subjects bearing upon the mechanic arts and the engineering problems therewith in the Franklin Institute.

New Publications.

Water and Public Health. The Relative Purity from Different Sources. By James H. Fuertes, M. Am. Soc. C. E. 75 pp. New York. John Wiley & Sons.

The Purification of Public Water Supplies. By John W. Hill, M. Am. Soc. C. E. 304 pp. New York. D. Van Nostrand Company, 1898.

The little book and the first seven chapters of the large book cover about the same ground, and it is interesting to note the almost perfect accord of the two authors with each other and with the common beliefs among sanitary experts. Typhoid fever is taken as the type of water borne diseases, as its prevalence seems under most circumstances to depend closely upon the impurity of the water supply, and all the arguments advanced are based upon the observations of this disease. Mr. Fuertes sums up his book in a short chapter of conclusions, some of the most important of which are that with poor drainage typhoid fever is sensitive to meteorological influences; with water supplies liable to pollution it is dependent upon the quality of water supplied and thus frequently on meteorological conditions; stream flow, sedimentation, oxidation, storage in reservoirs or lakes do not effect rapid removal of disease germs; efficient filtration of water from reasonably clean rivers does not effect such removal. The diagrams Mr.

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Mr. Hill uses other data and different forms of table and presents a similar case. He adds eight chapters on various methods of purification of water for cities, including sterilization, sedimentation, sand filtration, mechanical filtration, with descriptions of the Hamburg, Berlin and Fischer filters and the Anderson purifier. Chapters on the proposed filtration plans for Cincinnati and on the cost of filtration close the book. There is little that is new, but it is quite a convenience to have the latest information on the subject collected together in so convenient a form. Neither author seems to be familiar with all the bacteriological work that has been done. This is particularly true of the latter, but his intimate knowledge of practical construction more than makes up for any deficiencies in the otner direction, especially since the information given us by the bacteriologists is so meager and is frequently so conflicting.

Sewerage and Municipal Sanitation. A paper read before the annual convention of the Mayors' Association of South Carolina, May 10-12, 1898, by J. L. Ludlow, M. Am. Soc. C. E., Winston, N. C.

Mr. Ludlow's paper is an excellent popular presentation of the importance of municipal sanitation, well expressed in the proposition that "we should not live to build towns, but rather build towns to live in," coupled with the saying that "God builds the country and man builds the town." Mr. Ludlow says:

"Man does his part well or poorly according to the extent to which sanitation is considered and provided for. Were I to select a personnel as a nucleus upon which to build a town or city, I should give precedence tc the following order: the preacher with his virtues, the teacher with his learning, the doctor with his healing, the sanitary engineer with his pure water supply and sanitary sewerage, then the lawyer with his code of laws and the judge and jury to determine their violation. I would make the doctor the mayor and the engineer the marshal, with autocratic power to enforce sanitary regulations, and the violation of the sanitary laws should merit the greatest penalties. For the order of municipal improvements, I should place first an abundant supply of pure and wholesome water to be immediately followed by a modern system of sanitary sewerage, with its auxiliary plans of municipal sanitation. The preacher would encourage cleanliness next to Godliness, the competent teacher would inculcate principles of sanitation—next in order after the alphabet was learned. A municipality founded upon such principles and practices nominally incident, would speedily become a center of health, wealth, refinement, culture and accomplishment; material development and increased population could not be kept from the vicinity of such environments."

Mr. Ludlow discusses the merits of the combined and separate systems of sewerage. He also demonstrates with convincing facts and statements that sewerage and municipal sanitation pay. Statistics of many cities are cited to show the effect in reducing the death rate.

"Inspection of the Materials and Workmanship Employed in Construction," by Austin T. Byrne. 540 pages. 12 mo. Cloth, $3. New York: John Wiley & Sons.

A book of this sort has long been needed. To be complete it would be necessary to have it written by experts in the various lines of work whose processes are described, and would then appear in several volumes. More satisfactory books covering portions of the field have appeared, but this is the first one trying to cover any large part of the field of civil engineering construction. The result is very commendable, even though not altogether satisfactory, and the book will be very valuable to inspectors of public work. Portions of the book indicate, by their greater detail and more accurate statement, the lines of work in which the author is most expert. Some indefinite, some insufficient and some erroneous statements would have been eliminated if the various chapters had been referred to experts in their departments for revision. Engineers will find the work very valuable to place in the hands of inspectors, with such cautions as will be found necessary in some departments. The list of technical terms and the tables are well chosen for the uses of the book. The author has usually steered clear of any intereference with the detailed specifications for work, leaving instruction on points covered by them to the engineer in charge, and confining himself to the items common to all good specifications and to the omissions and errors of "forgetful" and "careless" employes of contractors. The book is so good that it would be well in future editions to remove the comparatively small number of blemishes by the expert revision of some chapters, as suggested.

Detroit: The Convention City. Illustrated. Compiled by O. A. Bierce, Secretary Detroit Convention and Business Men's League, Ltd. Price, 25 cts.

This is a new edition of the illustrated book on Detroit as a convention city, which has heretofore been mentioned in Municipal Engineeering, with the added feature of a beautiful view of the business center in the neighborhood of the city hall, in color photography, which is alone worth the price.

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Municipal Reports.

Report on the Sewage Disposal of the City of Toronto, Ont. By C. H. Rust, City Engineer.

Mr. Rust's report embraces much valuable information gathered by him in personal visitation of Worcester, Lawrence and Brockton, Mass.; Providence, R. I., and Reading, Pa. The sewage disposal methods of each of these cities is briefly described. He reviews also the steps that have been taken toward a solution of the problem in Toronto since 1857. He recommends for Toronto intermittent filtration, combined to some extent, with broad irrigation. He advises the purchase of 600 acres of land for this purpose and that about 300 acres of it be laid out for filter beds at once. The soil of the available land is of such a porous character that there would be no difficulty in disposing of 50,000 or 60,000 gallons of sewage on an acre of ground. The severe winters of Canada have been urged as an objection to the plan, but he thinks there would be no greater difficulty at Toronto than in the New England states. He is supported in this opinion by Rudolph Hering and Samuel M. Gray. Mr. Rust estimates the annual cost of pumping the sewage and maintaining the farm for the present population of Toronto at $70,000. There would be considerable revenue to offset this. Mr. Rust's report is valuable on account of the general information it contains, much of which is taken from books treating the subject of sewage disposal.

Twenty-fourth Annual Report of the Board of Public Works of the City of Detroit, Mich., for the fiscal year ending June 30, 1898.

The itemized statements of receipts and expenditures, compiled by the secretary, Mr. Robert Y. Ogg, occupy most of the space in the report. The construction work in the different departments is commented on briefly in the report of President Moreland and his associates, and much is added to the attractiveness of the pamphlet by a number of good photographic views of Detroit streets, some of which are reproduced in Municipal Engineering. The paving done during the year amounted to about amount of work would have been done had it not been for the contentions between the board and council over the paving brick specifications.

Mention is made of the new test to which brick is subjected in Detroit. A test pavement has been laid in Franklin-st., in which sections are paved with the fourteen kinds of brick which passed the rattler test. This street is down on the river front and close to the freight depots of three railroads, so that it will have much heavy traffic, and the board thinks that this will give "the people of Detroit a thorough knowledge of the best brick for wear that will be worth more than the tests of a thousand rattlers."

The importance of clean streets is well appreciated in Detroit. This has been the especial care of President Moreland, and his "white wings brigade" has made himself and his city famous. The method of cleaning adopted by the board is a push cart patrol system, and little barrels at convenient places in the business district. The force consists of fifty men, under the direction of a superintendent. They are dressed in white, having two suits each, which are put on clean Mondays and Thursdays. The streets are gone over once a week by the machine sweepers and then kept in hand by the push cart men.

Ninth Annual Report of the Syracuse Water Board for the year ending June 30, 1898. By W. R. Hill, Chief Engineer and Superintendent.

This report reviews the history of the movement which secured for Syracuse its excellent gravity water supply from Skaneatles lake, and gives a general description of the works, illustrated with some good views, two of which are reproduced in this number of Municipal Engineering. Mr. Hill, in his report for the year, mentions a special cap that has been put on all hydrants used for filling tanks with water for sprinkling purposes. Excessive use damages the hydrant, and this special cap prevents such wear. On the cap there is a small nozzle and valve, which can only be operated by a special wrench. The main valve is left partly open, so that there is a constant supply of water in the barrel of the hydrant. No one

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Bonded indebtedness of city, $19,959,278; disbursements for last fiscal year, $9,051,575; balance in treasury, $2,923,873; cost of sprinkling per year, $156,509, or $305.16 per mile; mileage of street railways, 300.4; paved streets, 419 miles, which have cost $24,500,000. Street cleaning under the block control system has cost for an area of 6.84 miles $109 per mile, or $15.94 per mile per day. The cost of machine sweeping is given in a report by E. M. Becker, superintendent, at $81 for 10½ miles of granite pavement, 50 feet wide, the force consisting of one two-horse sprinkler, three three-horse side sweepers, one three-horse piler, seven two-horse dump wagons and five laborers, three with hand brooms and two with hoes. The cost of cleaning eight miles of granite and two of asphalt pavement was $54, the force consisting of one sprinkler, two side sweepers, one gutter sweeper, one horse piler, six dump wagons and four laborers.

The report embraces the specifications in use by St. Louis for street signs, artificial stone flagging, granite street construction, brick street construction, rock asphalt pavement, Trinidad Lake asphalt pavement and street sprinkling.

Proposed Organization of City Clerks.

The organization of an association of city clerks is proposed by Bridges Smith, city clerk at Macon, Ga., who says of his project: "On the idea that almost all statistical information is collated by the city clerk, that he is the real storehouse of information as to municipalities; that he is the man of all others who is in close and complete touch with the administration, an association of such clerks would prove a gold mine of information and be the means of saving piles of money to city governments. Besides, being in the great majority of instances the hardest worked man as well as the man who really bears responsibility as well as the kicks of the taxpayer, he deserves an annual vacation."

Mr. Smith is in receipt of a large number of letters from city clerks approving the plan, and if he can get a sufficient number interested by next summer, he will take the initiative by endeavoring to have a convention held at some central point.

The Art of Doing Things Well.

Here and there one may meet an individual who is fortunate enough to derive real satisfaction from the mere doing of a thing well, with no thought or desire for any more tangible recompense. A capacity for doing even an unimportant task better than the average of humanity, associated with a pride in its performance, is a rare combination that has in it most of the essential elements of genius. It matters not whether the man who possesses the gift finds its outlet through the exercise of mere muscular tissue or whether he calls into requisition the highest order of reasoning or imaginative faculties; his tools may be the artist's brush or the ponderous ten-ton road roller; his reward is not measured in terms of the ordinary standards of value. It has been said that while any man can lay a pile of bricks straight, it is not often one is found who considers it worth his while to do so, even though when promotion comes it is given to the one who did. There is nothing new in this thought, but in the hurry of the present day it is often lost sight of. Municipal Engineering has just received two packages, and the addresses upon them illustrate the idea so well that we have taken the trouble to reproduce them. The contents of the packages were received safely, and doubtless would have been, even if the senders had not been so, perhaps unconsciously, painstaking. The first is from Bridges Smith, city clerk, Macon, Ga., and the other from the board of public works, Detroit. They speak for themselves:

The Need of Subways in Large Cities.

In a recent interview with a World-Herald reporter, Andrew Rosewater, city engineer of Omaha, Neb., said:

"The only really true perpetual motion is the tearing up of the streets. That is a problem which has never been solved. An engineer was once sent over to Europe to study this very thing and when he returned his report consisted of this:

" 'Gentlemen—I have to report that the only permanent thing I could find was permanent street repairs.'

"The nearest solution of the question which has come to light so far has been that of subways. When we can use the space under the sidewalks, now used by property-owners, then there will be little tearing up of streets. With subways running along each side of the street, subways large enough for all kinds of pipes, ready to connect with the houses, then there will be no tearing up of streets in case of making a connection or the bursting of the pipe. But sewers will wear out and collapse, and when they do the street paving over them will collapse also."

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MACHINERY AND TRADE.

Proposed Combination of Paving Brick Manufacturers.

Considerable attention has lately been given in the press dispatches to reports of a proposed combination of the paving brick manufacturers. While many of the reports have been of a contradictory nature, the frequency with which the subject is mentioned has led to the belief that there was something more than mere rumor back of them. Some inquiries regarding the matter have recently been made by Municipal Engineering. Many of the leading brick men profess entire ignorance on the subject, beyond what is stated in the dispatches, and express doubts of their ultimate success if actually contemplated. No opposition to the plan was encountered and a number of those spoken to expressed a hope that it might succeed. The name of Mr. William G. Hipp, a brick manufacturer of Massillon, O., has been mentioned as the responsible head of the undertaking, and a gentleman closely associated with Mr. Hipp when questioned stated that it is a fact that for some months past a movement has been under way and that the prospects for its success were encouraging. He further stated that at a meeting of the leading paving brick men some months ago various plans were considered, having in view the betterment of the condition of the trade generally and a more satisfactory understanding among the manufacturers. None of the plans proposed being considered practicable, the delegates named Mr. Hipp as a committee of one to devise and submit some suitable scheme. It appears that the so-called consolidation is the outcome.

The brick people feel that they have suffered unnecessarily in the past from the sins of a few of their number, who have marketed a poor quality of brick and have done much to create in many quarters an unwarranted prejudice against brick pavements in general. The prices, too, have been so low that what business was done realized little profit, if not actual loss, and while the past year has seen a decided improvement in the demand, many dealers having sold their entire output without difficulty, prices have not been well maintained, although somewhat better than a year ago.

The plans now under way include the formation of a corporation to purchase and operate all the leading brick plants in the country, and this, it is believed, can be done and the plants run at a profit without any increase of prices. Good management, coupled with improved machinery and the practice of the economies only possible under such a plan, will, it is claimed, result in lower prices, rather than the reverse, with a fair profit to the operators besides. It will be the aim to market for paving purposes only the very highest quality of brick and at the same time to institute an active campaign of education in the interests of brick paving in general throughout the country, and to see that the brick people have the same kind of representation and to the same extent that manufacturers of other materials now enjoy. The movement, so the gentleman from whom the above statement was received states, has progressed very satisfactorily thus far. Options for the purchase outright of about 85 per cent. of the desirable plants have been secured and a large portion of the capital needed has also been subscribed. Mr. Hipp himself declined to make any statement for publication, although he admitted that he has done a great deal of work and spent a large amount of time upon the subject.

Trade Conditions and Prospects.

Upon a recent trip through the paving brick district of Ohio a representative of Municipal Engineering found most of the brick men very well satisfied with the business of the past season. Many of them sold their entire output without especial effort and have contracted for large deliveries for the coming year. Prices for a first-class article have been fairly well maintained, and while there has not been as much profit as the volume of the business would warrant, the conditions have been far better than for several years preceding. It is noticeable that the makers of what are considered the best brick have had less difficulty in disposing of their stock at good prices than have the makers of an inferior quality at a considerably lower figure. One firm in northern Ohio states it has made heavy shipments as far south as the gulf states, and another has been doing a profitable trade in the Canadian provinces in the face of a heavy tariff. The cement manufacturers are feeling quite complacent, the demand having exceeded the supply for months past. The sewer pipe men, on the other hand, complain bitterly of prices and claim that the business is carried on at an actual loss. The general business outlook in all lines, however, is full of encouragement. Machinery men report large orders for home as well as foreign delivery, bridge men are busy and material men and contractors are anticipating an active season with the opening of spring.

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Recent Inventions.

612,839. Oct. 25, 1898. Means for protecting piles from aqueous insects. Hugo Gallinowsky, St. Louis, Mo. Assigned to Lithosite Mfg. Co., same place. (A protective covering composed of fibrous material impregnated with magnesium chloride and calcined magnesite.)

612,904. Oct. 25, 1898. Sewage filter. Theodor Huelssner and Paul Roehrig, Leipsic, Germany.

612,919. Oct. 25, 1898. Apparatus for softening and excavating frozen earth. J. H. L. Tuck, San Francisco, Cal. (A caisson having an open bottom and means for introducing heated air into the caisson. An excavating tool is mounted in the caisson and so arranged that it may be operated from the outside.)

613,779 and 613,780. Nov. 8, 1898. Refuse cart. Carl Rosenfeld, New York, N. Y. (Carts particularly designed for hauling garbage and similar refuse, means being provided for closely confining the refuse.)

613,910. Nov. 8, 1898. Street flushing machine. M. A. Rich, Kansas City, Mo. (A wagon, the frame of which is composed of piping and so arranged that it may be connected with any convenient water supply.)

614,008. Nov. 8, 1898. Portable jail. W. S. King, Darlington, S. C.

614,198. Nov. 15, 1898. Apparatus for melting and removing snow. D. Boorman, A. P. Sharp and J. O'Neil, Altoona, Pa. (A basin supported in a sewer opening, beneath which are mounted suitably protected gas burners, by means of which the basin may be heated.)

Trade Notes.

The establishment of a cement factory at Athens, Mich., is contemplated.

The asphalt plant of the Atlantic Alcatraz company, Newark, N. J., was damaged by fire Nov. 19.

The plant of the London Portland cement company, located at Marlbank, Ont., Canada, will be reconstructed.

The establishment of a new Portland cement plant near Columbus, O., is contemplated by eastern capitalists.

J. V. Rose, Sharon, Pa., has purchased the Eclipse paving brick plant at Doughton, O., and will remove it to Sharon.

The Monarch Stone company of Milwaukee, Wis., has been incorporated by F. J. Kipp, J. W. Bingham and William F. Durand.

The Michigan Alkali company, Wyandotte, Mich., will erect a large plant for the manufacture of Portland cement from the refuse of the works.

The Austin & Western Co. of Chicago will probably be given a contract for furnishing Marinette, Wis., with a stone crusher, according to press reports.

The purchase of a stone crusher is advised by the common council committee, at Fond du Lac, Wis. The purchase will be deferred, however, until next spring.

A recent press report from Hagerstown, Md., stated that the Potomac cement works, near Shepardstown, had been sold to M. W. Blunt, jr., of Washington, D. C. The plant consisted of thirteen acres of land, brick and cement factory, kilns and Potomac river right.

The O. S. Kelly company, Springfield, O., will be awarded a contract for a steam road roller for the city of Dixon and Dixon township, Ill., according to press reports.

Contracts for the design and construction of a Portland cement plant at Wyandotte, Mich., for the Michigan Alkali company, have been awarded to Lathbury & Speckman.

Japan has 10 cement firms and efforts are being made to effect amalgamation in order to reduce production and maintain prices. It is said that nine of the companies have agreed to this course.

The Webster City Brick and Tile company, Webster City, Ia., has brought suit for damages against that city, claiming that its course in taking possession of their lands for a pumping station was illegal.

The works of the Peerless Portland Cement company, Union City, Mich., were damaged by fire recently, entailing a loss of $40,000. There was no insurance on the property and the loss falls on L. K. Forsythe, J. E. Saxton and others of Chicago.

The sewer pipe manufacturers of the Ohio valley have under consideration a proposition to consolidate. The proposition comes from F. L. Tapcott of New York City, who claims to represent certain capitalists who desire to acquire the terra cotta plants.

John Murphy & Co. of Columbus, O., made an assignment recently in favor of Florence D. Sullivan. Mr. Murphy was a manufacturer of Portland cement, grout filler for pavements and general contractor. The assignment includes all of his personal and real estate.

The Peerless Portland cement works were badly damaged by fire Oct. 6, entailing a loss of about $40,000. The officers of the company are J. E. Saxton, president, and Lee K. Forsythe, secretary and treasurer, of Union City, Mich.; Robert M. Wood, Chicago, vice-president.

A lock paving brick has been invented by F. J. French of Toronto, Ont. The invention consists of a locking brick, by which the stones dovetail into each other, and the economy resulting from its use lies in the fact, Mr. French claims, that concrete would no longer be found necessary to make the pavement lie smooth, even and solid, but the bricks could be laid simply on the foundation. Mr. French is a paving inspector in Toronto.

The Chicago Portland Cement company will soon complete its new plant at Oglesby, LaSalle county, Ill. All materials necessary in the manufacture of Portland cement are to be found on the ground. The raw material used is a shell lime rock deposit, averaging 25 ft. in depth, and with only a little stripping, making it easy quarrying. A strata of shale clay, 5 ft. thick and of fine quality, underlies the shell lime deposit, and from these two materials the highest grade of Portland cement can be produced. The German method will be carried out, the forming of the raw material into brick and burning in an ordinary kiln. The buildings will be of steel and concrete, with tile roofs, and absolutely fire-proof. The power will consist of a 750 H. P. cross-compound condensing engine, made by the Gates Iron works, and three 280 H. P. water tube boilers. The Bradley Pulverizer company of Boston will furnish 12 Griffin mills for pul-

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verizing the raw material and clinker, and 10 continuous kiln chambers will receive the cement brick from the drying-room.

The Jeffery Manufacturing company of Columbus, O., have recently taken up the manufacture of the Columbian separator, screen and bolter and state that they have erected an experimental machine at their works for the testing of such material as may be sent them for that purpose. Parties interested in the screening or separating of cement, cement clinker, ores, phosphate rock, marble, fertilizer materials, bone ash, plaster paris, sand, coal, earth clay, etc., etc., can secure further data and prices by addressing the manufacturers.

During the past summer the Joseph Dixon Crucible company of Jersey City, N. J., have added an extension to their pencil factory, 40 by 90 ft., three stories high. The same is driven by electric power from a generator placed in the main factory. No expense has been spared in the equipment of this addition in the way of up-to-date elevators, furnaces, dry-rooms, etc. The company will also put down an artesian well, several hundred feet in depth, for a supply of water for factory use, and sometime during 1899 various other additions will be built to the Dixon company's very extensive plant. The Dixon company was established in 1827, but during all of its more than three score years and ten of busy life, no year has in any way equaled 1898 for volume of business; its plant has been running continuously, yet the company is behind its orders in all departments. As the Dixon company's products go into every known field of industry: the iron workers, the brass workers, the printing trades, the stationers, the cycle manufacturers, the hat manufacturers, the paper mills, etc., the rise or fall of the volume of business done by the Dixon company may be taken as a very excellent standard or pointer on the condition of business generally.

The Fifth-ave. Plaza, Fifty-eighth and Fifty-ninth-sts., New York City, is being surfaced with natural rock asphalt by the New York Mastic Works, the American branch of the Compagnie Generale des Asphaltes de France, who have asphalt mines at Seyssel, France, and Ragura, Sicily. Among other contracts recently awarded to this company are Claiborne and Rampart-sts., New Orleans, and Rue du Cloitre, Notre Dame, Paris, along the venerable cathedral of that name. The United States government has been using Seyssel asphalt mastic very extensively in fortifications and the demand for its use in schools, warehouses and breweries has been very large. The new Ohio state capitol, Columbus, is to be roofed with this material and the union depot at Terre Haute, Ind. is having the platforms laid with natural rock asphalt. The basement floor of the Albany savings bank has been covered with Seyssel asphalt and considerable work has been done in the grounds of the capitol at Hartford, Conn., and in the parks of New York and Allegheny, Pa. The driveways in the Philadelphia public buildings have been laid with the company's compressed asphalt this season, and the same material has been laid during the year at Fairmount park, Philadelphia, and for crosswalks in Central park, New York.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Atlanta, Ga.—The county commissioners have purchased an immense rock crusher, preparatory to the contemplated improvement of a large number of county roads.

Binghampton, N. Y.—Corporation Counsel Stewart was directed Nov. 15, to draft bills allowing this city to construct its own brick pavements.

Detroit, Mich.—The Talbott Paving company obtained judgment against the city of Pontiac, Ill., in the sum of $12,353 and costs. The suit was brought to compel the payment of special assessment warrants issued by the city in 1895, for paving around the court house square.

Kansas City, Mo.—The council has taken preliminary steps toward making all the street railway companies in this city pave between the lines of rails with the same material that is used on the streets. A wide tire ordinance has been adopted to protect the boulevards and parkways of the city.

St. Louis, Mo.—The annual appropriation for street repairs in this city was originally $100,000, but $40,000 of this amount has been

tion Counsel Whalen, that no ordinance could be signed by the mayor unless the resolution in the matter of improvements was identical with the resolution adopted by the board of public improvements, will have a tendency to delay improvements in this city. A number of resolutions adopted by the council authorizing improvements have been returned by the mayor without his approval, and in consequence the work cannot be proceeded with.

Morgantown, W. Va.—Berry & Kidder, who secured the contract for paving the streets of this city, have thrown up their contracts and entered suit against the town for the payment of what they claim is due them for damages. After an examination of the work the council refused to pay for the street paved, claiming that the street was faulty and did not fill the specifications under which the contractors took the work. The council will fight the matter in the courts.

Chicago, Ill.—The board of local improvements has decided that granite, brick, asphalt or macadam will be the only pavements recommended in the future. Cedar

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lector Marin from collecting the special assessment dues for new paving and restraing the county and city officials from selling the property of the complainants for the special assessment. A final hearing will be given in December.

CONTEMPLATED WORK.

Atchison, Kas.—S. Fourth-st. will be paved in the spring.

St. Joseph, Mo.—Brick paving is contemplated for E. Edmond-st.

Flint, Mich.—Estimates have been made for paving Kearsley-st. with brick.

Dallas, Tex.—The question of permanent sidewalk construction is being agitated.

Warren, Ill.—Vitrified brick gutters on either side of Main-st. are contemplated.

Altoona, Pa.—The issue of $229,000 paving bonds is contemplated by the council.

Carrollton, Mo.—This city has voted to issue $50,000 bonds for paved streets and sewers.

Oshkosh, Wis.—Macadam paving is contemplated for a number of streets next summer.

Janesville, Wis.—Brick paving is suggested to replace the Nicholson pavement on W. Milwaukee-st.

Topeka, Kas.—Brick paving will be petitioned for Huntoon-st., from Topeka-ave. to Filmore-st.

Tonawanda, N. Y.—The board of trustees will be asked for more street paving within the city limits.

Gulfport, Miss.—The town council has decided to issue $10,000 bonds for streets and drainage.

Richmond, Va.—Granolithic paving, curbing and gutters are contemplated for a large number of streets.

Wilkinsburg, Pa.—The borough council authorized, Nov. 14, an issue of $30,000 worth of street improvement bonds.

Cortland, N. Y.—Paving has been petitioned for on Groton-ave., from Main to Otter creek. Bd. vil. trustees.

Terre Haute, Ind.—Linton township has voted to construct fourteen miles and Nevins township seventeen miles of gravel roads.

Houston, Tex.—Bids will be asked for brick and asphalt paving in about two months, according to press reports. T. A. Miller.

Macon, Ga.—The council determined, Nov. 1, to pave Mulberry-st. and Second, from Cherry to Mulberry with brick.

Waukegan, Ill.—Estimates have been submitted by City Engineer Bowen for asphalt, brick and macadam paving on West-st.

Key West, Fla.—(Special.)—C. J. Huelsenkamp, chrmn. ways and means com., says that asphalt blocks are needed.

Spokane, Wash.—The board of public works has been instructed to prepare plans for paving a large number of streets with asphalt.

Owosso, Mich.—The council was presented with a petition, Nov. 14, to pave four blocks of residence streets with asphalt.

Carthage, Ill.—Bids for brick paving will be asked about Jan. 1, according to press reports. M. P. Berry, prest. bd. local improvements.

Sandusky, O.—About 9,749 sq. yds. of paving and 5,200 lin. ft. of curbing is contemplated for Campbell-st. J. C. Brewer, cy. engr.

Quincy, Ill.—Property owners on Second-st., between Broadway and Jersey, are urging the question of paving. Prest. Deaderick.

Elkhart, Ind.—The council is considering a resolution for 10,000 sq. yds. of brick paving. D. F. Cordrey, cy. engr.

Elizabeth, N. J.—An ordinance was passed, Nov. 15, for paving Magnolia-ave., between Spring and Division-sts., with asphalt.

St. Johns, Mich.—The question of paving Clinton-ave. is being considered. Brick has been suggested. Prest. Travis of council.

Los Angeles, Cal.—An ordinance was passed Nov. 14 to repave Main-st., from First to Marchessault, with asphaltum.

Clayton, Mo.—Edgar Rapp, road comr., has been directed to advertise for bids for 40 blocks of macadam paving.

Elgin, Ill.—An ordinance has been passed to pave National-st., from National-st. bridge to Villa-st.; estimated cost, $6,944.

Des Moines, Ia.—A resolution has been passed to pave W. Twenty-first-st., E. Fifth and E. Maple-sts., with brick. John MacVicar, mayor.

St. Paul, Minn.—The board of works has deferred until Feb. 1 the matter of boulevarding Marshall-ave., from Wheeler tc Cleveland-aves.

Cambridge, O.—The county commissioners will be presented with a petition Dec. 5 for the construction of a road. B. C. Johnson interested.

Rockford, Ill.—The board of local improvements has ordered Kilburn-ave., Park-st., College-ave. and S. Court-st. macadamized.

Bridgeport, O.—This city voted Nov. 8 to pave with brick and macadam, at an estimated cost of $75,000. J. A. Fawcett, cy. clk.

Kalamazoo, Mich. — Estimates have been submitted for brick paving in Main and Portage-sts. and brick and asphalt in W. South-st. Alderman Westbrook.

Cleveland, O.—Ordinances have been passed to pave Southern and Amesbury-aves. and Logan-place with brick. Howard H. Burgess, cy. clk.

Kansas City, Mo.—A resolution has been passed for paving Perry-ave., from Bellefontaine to Indiana-ave. with asphalt. C. S. Curry, cy. clk.

Duluth, Minn.—The board of public works, believing a new pavement is needed, is opposed to making temporary improvements to Fifth-ave., west. Granite blocks are favored.

Sioux Falls, S. D.—An ordinance is being considered for the construction of cement sidewalks in certain districts. L. M. Estabrook, cy. audt.

Toledo, O.—A resolution has been passed to pave Woodruff-ave., from Ashland-ave. to Madison-st., with asphalt, brick or granite. Lem P. Harris, cy. clk.

Renfrew, Ont.—Plans are being prepared for road improvements, including the construction of artificial stone sidewalks. The question will be voted on in January.

Louisville, Ky.—The board of works will soon re-advertise for bids for asphalt paving on E. Broadway and W. Chestnut-sts. and Hepburn and Von Borries-aves.

Newton, Mass.—The aldermen have appropriated $2,100 for improving Walnut-st. and have under consideration a general appropriation of $39,500 for highways.

Moline, Ill.—A petition is in circulation to pave all the streets and avenues from and including Fifth-ave. to Twelfth-ave., and between Seventh and Fifteenth-sts.

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Santa Rosa, Cal.—The city engineer was instructed Nov. 15 to furnish estimates of the cost of paving Fourth-st., from D-st. to McDonald-ave. with bituminous rock. Jas. S. Sweet, mayor.

Omaha, Neb.—A petition will be circulated to repave Farnam-st. with asphalt. The question of macadamizing the boulevard, from Omaha to Ft. Crook, is being considered by the South Side Improvement club. Chrmn. Power.

Peoria, Ill.—Resolutions and estimates were adopted Nov. 14 for paving portions of Madison-ave. and Elizabeth-st. and the city engineer was directed to prepare estimates for brick paving in St. James-st. and Seventh-ave.

Baltimore, Md.—The city council committee on highways has reported favorably the ordinance for paving Streeper-st., from Fait-st. to Eastern-ave., with brick, and Gough-st., from Patterson Park-ave. to Broadway, with asphalt.

Atlantic City, N. J.—An ordinance has been passed to pave all street intersections of Pacific-ave. with brick instead of laying brick crossings and paving the intersections with macadam, as provided in the original ordinance.

Philadelphia, Pa.—The Fairmount park committee has decided to recommend favorably the ordinance appropriating $25,000 for macadamizing Lincoln-ave., from Wissahickon to Johnson-ave.

St. Louis, Mo.—Asphalt strips on either side of Washington-ave. and Olive and Fourteenth-sts. is contemplated. The street committee of the B. P. I. is considering specifications. Green-ave., from Marcus to Euclid, will have a top dressing of novaculite.

Anderson, Ind.—Ordinances are being prepared for paving Ninth, Tenth, Twelfth and Jackson-sts. and the contracts will probably be let in January and February. Mayor Dunlap, City Engineer Rogers, Street Commissioner McCandliss and Councilmen Woolley, Mathes and Kirkham visited Indianapolis Nov. 25 to inspect street paving preparatory to doing this work. Brick seems to be favored by these officials.

Chicago, Ill.—The board of local improvements is taking steps toward replacing wooden sidewalks with concrete or stone. The committee on streets and alleys, north, recommended to the council for passage, Nov. 21, ordinances converting Garfield, Webster and Belden-aves., between N. Clark-st. and N. Park-ave., into boulevards. The West Park Commissioners were asked, Nov. 22, to co-operate with the residents of Cicero, River Forest, Riverside, Maywood and Harlem in an effort to extend the West Park boulevard far enough west to benefit those places. Estimates have been furnished by the Lincoln park board for a boulevard curbing on Main-st. I. A. Miller, cy, engr.

Omaha, Neb.—Bids are asked until Dec. 2 for paving Twenty-second-st. with asphalt, brick or stone and curbing. Andrew Rosewater, chrm. B. P. W.

Toledo, O.—Sealed proposals will be received until Dec 5, for paving Kenilworth-ave., from Fulton to Cherry-st., with manufactured block. Lem P. Harris, cy. clk.

Jacksonville, Fla.—Bids will be received Dec. 15 for paving Main-st., from Hogan's creek bridge to Eighth-st., 22,000 sq. yds., with brick, curbing, etc. Cy. engr.

Hamilton, O.—(Special.)—M. O. Burns, cy. clk., says that all the bids received Oct. 24 for paving Second-st. with brick, asphalt or block were rejected and new bids will be received Dec. 19.

Buffalo, N. Y.—Bids will be received until Dec. 6, for repairing the asphalt pavement in Fillmore, Richmond and Porter-aves., and other streets, for a term of five years. Park Comrs.

Toronto, Ont.—Tenders will be received until Dec. 5 for furnishing pit gravel, screened or unscreened, sand, paving brick, cedar paving posts, etc. Mayor John Shaw, chrm. bd. control.

Dayton, O.—Bids are asked until Dec. 12 for paving Sycamore, Council and Charter-sts. with Buckeye block, as follows. Paving 7,631 sq. yds.; curbing, 5,630 lin. ft.; circular curbing, 165 ft. J. L. Baker, prest. bd. cy. affairs.

Cincinnati, O.—Sealed proposals will be received until Dec. 6 for paving Marquis-ave., from Colerain-ave. to Miami-st., with brick and curbing. Bids will be received until Dec. 20 for macadamizing Paradrome-st., from Louden to Martin and setting curbs and crossings, flagging, paving gutters, etc. H. Spellmire, clk. B. C. A.

CONTRACTS AWARDED.

Seattle, Wash.—The contract for grading E. Jefferson-st. was awarded, Nov. 11, to C. J. Erickson for $2,071.80.

Lawrenceburg, Ky.—The contract for paving the streets with vitrified brick has been awarded to W. A. Newman of Lexington.

Trenton, N J.—Thos. McGovern of this city secured the contract for macadamizing Pennington road for $31,661.87.

Sharpsburg, Pa.—The contract for asphalt and brick paving was awarded to Booth & Flinn for $60,000.

Tampa, Fla.—The contract for vitrified brick paving was awarded to the Coaldale Paving company at $1.36 a sq. yd.

Wilmette, Ill.—The contract for macadamizing several streets was awarded, Nov. 11, to C. M. Porter of Chicago for $9,082.50.

Scranton, Pa.—The Alcatras company, New York City, was awarded the contract, Nov. 3, for paving Hyde Park-ave., from La-

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Niagara Falls, N. Y.—The contract for paving Second-st. with asphalt was awarded to H. P. Burgard of Buffalo at $2.05 and Cherry-st. at $2.20 a sq. yd., 10 yr. guarantee.

Marshall, Mo.—The Barber Asphalt Paving company, New York City, was awarded the contract for 9,520.9 sq. yds. of asphalt paving at $2.10 a sq. yd., or $19,993.89.

Boonville, Ind.—The contract for macadamizing Third-st., from Locust to the Air Line depot, 1,250 ft., has been awarded to Reavis, Orr & Co. of Princeton at $1.41 a running foot or $3,953.

Pittsburg, Pa.—Contracts for county road improvements were awarded Nov. 9 as follows: Streets Run road, $31,919.40 and Crooked Run road, $38,759, Booth & Flinn; Freeport, Keeling & Ridge, $40,392.

Cincinnati, O.—The Cincinnati Granitoid Paving company was awarded contracts Nov. 4 for keeping in repair for the ensuing year the eastern and western sidewalk districts of this city at $4,320 and $4,293, respectively.

Sistersville, W. Va.—The contract for 539 square yards of brick paving in Hill-st. has been awarded to W. F. Rice as follows: Excavation, 20 cents a cubic yard; curbing, 24x5 inches, 40 cents; paving, Spilman No. 2 brick, 79 cents a square yard.

Toledo, O.—The contract for paving Eastern-ave. was awarded to G. H. Bodette Nov. 17 for $4,719.35, using Nelsonville block. Other contracts awarded were: Twenty-first-st., Buckeye block, W. J. & J. J. McMahon, $2,831.74; Michigan-st., Nelsonville block, H. P. Streicher, $2,929.21.

Kansas City, Mo.—The public improvements committee of the city council reconsidered the award of the contract for paving Seventeenth-st., which was given the Dennison Paving company at $2.05 a square yard, and on Nov. 12 the contract was awarded to the Barber Asphalt Paving company at $2.12 a square yard.

Ft. Wayne, Ind.—Moellering & Co. secured contracts Nov. 17 for paving two alleys as follows: Alley between Main and Berry-sts., from Maiden Lane to Webster-st., Metropolitan block, $1.55 a square yard; alley between Jefferson and Lewis-sts., from Calhoun to Webster, Nelsonville brick, $1.90.

St. Joseph, Ill.—The Bermudez Asphalt company, Chicago, has been awarded the contract for paving Seventh-st., from Olive to Robidoux, with asphalt, at $1.53 a square yard. The other bids received were: Assyrian Asphalt company, $1.78; Hugh Murphy, Omaha, $1.75; C. R. Hunt, $1.75; J. B. Smith & Co., Chicago, $1.42.

Indianapolis, Ind—Bids were received Nov. 12 for brick paving in Miami-st., from Delaware to Alabama, as follows: W. C. Allen, brick, $1.23 a square yard; W. H. Abbott, Boston blocks, $1.27; Daniel Foley, brick, $1.29; Joseph Cooper, blocks, $1.31; W. A. Bruce was awarded the contract for laying cement sidewalks in College-ave. at 69 3-5 cents a square foot.

Cleveland, O.—The contract for paving Quincy-st. with Medina stone has been awarded to Brennan & Buettner at 23½ cents a foot, or $31,000. Bids were received Nov. 10 for the Berea road improvement in Middleburg and Rockport townships as follows: J. E. Asling, $7,471.50; Emery Wing, $7,873.40; T. H. Garland, $7,945.50; Miller Construction company, $8,160; M. E. Long, $8,645; T. M. Campbell, $8,646; Williams & Morse, $9,469.50! A. Trebman, $9,497.50.

Scranton, Pa.—The Barber Asphalt Paving company was awarded the contract Nov. 17 for repairing the asphalt streets for a period of 10 years, as follows: Repairing and maintaining entire pavement, $17,320 per annum; laying old curb, 10 cts.; relaying and redressing old curb, 25 cts.; new curb, 53 cts.; circular curb, 90 cts.; new concrete and pavement, $2.50 a sq. yd. There were three other bidders for the work, George McDonald, Alcatraz Paving company and Pennsylvania Asphalt company.

Dallas, Tex.—Bids were received Nov. 14 for about 11,400 sq. yds. of street paving, under the following specifications: 1. Two inches of asphalt upon the present bois d'arc blocks pavement. 2. Two inches of asphalt upon a 6-in. concrete foundation, with 1-in. cushion of sand. 3. Vitrified paving brick on 6-in. concrete foundation, with 1-in. cushion of sand. The bids, which are for a 5-yr. guarantee, are as follows: Gilsonite Roofing & Paving company, St. Louis—Ex., 50 cts. a cu. yd.; removing bois d'arc blocks, 7 cts. a yard; lay 6-in. concrete, 55 cts. a sq. yd. 2-ins. asphalt, $1.60 a sq. yd. C. W. Olcott, Dallas—Remove bois d'arc blocks, 8 cts. a yd.; ex., 20 cts. a cu. yd..; lay No. 1 concrete, 63 cts. a sq. yd.; No. 2 concrete, 76 cts.; brick paving, 79 cts. a sq. yd. Texas Construction company., Galveston, Tex.—Lay 2-in. No. 1 concrete, $1.89; No. 2 concrete, $2; No. 4 concrete, $1.74; grading, 10 cts. a cu. yd.; removing blocks, 8 cts. Standard Light & Power company, Dallas—Grading, 35 cts.; removing blocks, 10 cts.; lay No. 1 concrete, 75 cts.; No. 2 concrete, 85 cts.; lay 6-in. hexagon bois d'arc blocks, $1.55, and 8-in. blocks, $1.60. Franklin Fireproofing company, Dallas—Asphalt pavement No. 3 on concrete foundation No. 1 or 2, $1.92; 10-yr. guarantee, $1.97. Barber Asphalt Paving company, New York—Removing blocks, 5 cts.; ex., 5 cts.; lay No. 1 concrete, 42 cts.; No. 2 concrete, 50 cts.; lay No. 1 asphalt, $1.80; No. 4 asphalt mixture with No. 2 concrete, the pavement to be 4-ins. of asphalt, 1-in. binder and 1½ ins. wearing surface, $2.12. Brown & Dabney, Dallas, three bids—1. Asphalt, $1.80; grading, 30 cts.; removing blocks, 6 cts.; lay No. 1 concrete, 45 cts.; No. 2 concrete, 58 cts. 2. Vitrified brick, with No. 1 concrete, $1.82; No. 2 concrete, $1.95; grading, removing blocks and concrete, same as for asphalt. 3. Laying 6-in. hexagon bois d'arc blocks, $1.46; 7-in. blocks, $1.48; 8-in. blocks, $1.51; new blocks, $1.17; resaw old blocks to 6 ins. long and place them, $1; grading and removing blocks, same as for asphalt. Ayres Asphalt Paving company, Zanesville, O.—Ex., 18 cts.; remove old blocks, 10 cts.; lay No. 1 concrete, 53 cts.; No. 2 concrete, 60 cts.; No. 1 asphalt, $1.65; pavement No. 4, being 4 ins. concrete, 1-in. binder and 1½-in. top, concrete No. 1, 43 cts.; No. 2 concrete, 50 cts.; asphalt, No. 4, $1.48.

SEWERS.

Newton, Kas.—The South Side Sewer company has secured a charter.

York, Pa.—The York Sewer company has received a charter to construct and maintain sewers in this city.

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Galveston, Tex.—Urbon H. Broughton of Chicago, representing the city, and T. H. Wilson, representing the sewer company, have been authorized to select a third person and fix the price of the plant of the Galveston Sewer company, which the city contemplates purchasing. The value of the plant is supposed to be about $75,000.

CONTEMPLATED WORK.

Bismarck, N. D.—A sewerage system is contemplated.

Aledo, Ill.—The question of building a sewerage system is being agitated again.

Southbridge, Mass.—This town has voted to purchase land for sewage disposal.

Racine, Wis.—A sewer will be built in Sluason-ave., from Asylum to Phillips.

Spokane, Wash.—The question of building sewers in the East End will be revived.

Chester, Pa.—Ordinances have been passed for bulding sewers on Edgmont-ave. and Norris-st.

Atchison, Kas.—The question of building the South Atchison sewer is again being agitated.

Dennison, Tex.—Plans and estimates for a sewerage system have been ordered. Mayor Lebrecht.

London, O.—The construction of a 5-ft. sewer has been recommended by City Engineer Harvey.

East Liverpool, O.—Bids will be asked soon for furnishing 8 miles of 12 to 4-in. sewer pipe.

Pittsfield, Mass.—The board of public works voted Nov. 11 to build a sewer in Circular-ave.

Lake Linden, Mich.—The question of building a sewerage system will probably be voted on.

Elkhart, Ind.—Plans have been ordered for 5 miles of 12 to 24-in. pipe sewers. D. F. Cordrey, cy. engr.

Jackson, Miss.—The construction of a sewerage system is contemplated. Milsaps Virden and John Hart.

Independence, Mo.—Bids will be received until Dec. 13 for sewer bonds. S. A. Sullivan, cy. clk.

Syracuse, N. Y.—The common council has declared intention of building sewers in McKinley-ave. and Leon-st.

Key West, Fla.—(Special.)—A sewerage system is needed. C. J. Huelsenkamp, chrm. ways and means committee.

Tiffin, O.—Plans and specifications have been prepared for a lateral sewer in the alley between McCollum and Lewis-sts.

Worcester, Mass.—An ordinance has been passed for a separate sewer on Green and Water-sts.; estimated cost, $119,000.

Woonsocket, R. I.—A resolution was passed, Nov. 15, to build a sewer in Main-st., from Clinton-st. to Harris-ave.

Macon, Mo.—The question of building a sewerage system will be voted on, Dec. 5; estimated cost, $23,000.

Milwaukee, Wis.—Sewers have been petitioned for in the following streets: Fifth-st., from Lapham-st. to Burleigh-st.; Fifth-st., from Burleigh-st. to Center-st.; Fifth-st., from Center-st. to Locust-st.; Fifth-st., from Locust-st. to Keefe-ave.; Fifth-st., from Keefe-ave. to Hampton-st.; Fifth-st., from Hampton-st. to Silver Spring-st.; Fifth-st., from Silver Spring-st. to Capitol-dr.; Fifth-st., from Capitol-dr. to Glendale-ave.; Fifth-st., from Glendale-ave. to Brown Deer-road; Fifth-st., from Brown Deer-road to Good Hope-road; Fifth-st., from Good Hope-road to Bradley-ave.; Fifth-st., from Bradley-ave. to Fairmount-ave.; Fifth-st., from Fairmount-ave. to Wauwatosa-ave.; Fifth-st., from Wauwatosa-ave. to Wauwatosa-road; Fifth-st., from Wauwatosa-road

St. Louis, Mo.—Bids are asked until Dec. 6 for constructing 15 and 12-in. pipe sewers in several streets. Robert E. McMath, prest. bd. local imp.

Newburg, N. Y.—Bids are asked until Dec. 19 for building the First-st. main sewer, including brick and vitrified sewers, cement, manholes, etc. D. J. Coutant, clk. B. P. W.

Washington, D. C.—Bids will be received until Dec. 10 for constructing the northerly portion of the Tiber creek and New Jersey-ave. high-level intercepting sewer. John B. Wight, prest. dist. comrs.

Denver, Col.—Bids will be received Dec. 15 for storm sewers, which contemplate the drainage of 2,100 acres of land at a cost of about $1,000,000. Harvey C. Lowrie, M. Am. Soc. C. E., designing engineer.

CONTRACTS AWARDED.

Keokuk, Ia.—The contract for a 6-in. sewer was awarded to F. E. Stannus & Co.

Scranton, Pa.—The contract for the Stipp court sewer has been awarded to V. O'Hara for $1,960.

Toledo, O.—The contract for building a sewer in Champlain and Buckeye-sts. was awarded to W. J. McMahon.

Redlands, Cal.—The contract for constructing a sewer has been awarded to Afleck & Ormand for $4,700.

Milwaukee, Wis.—The contract for building a sewer in Scott-st. has been awarded to Jos. O'Donnell at 89 cts. a ft.

Piqua, O.—The contract for building a 4-ft. sewer in Swift-st. has been awarded to C. E. Martin, city, for $4,124.

Cedar Falls, Ia.—The contract for building a brick storm sewer has been awarded to Ford & Delahunt for $3,306.

Santa Ana, Cal.—Williams, Belcher & Co. secured the contract for constructing a sewerage system in the city for $37,000.

St. Louis, Mo.—The contract for repairs to the Mill Creek sewer was awarded Nov. 9 to the Heman Construction Co. at $9.45 a lin. ft.

Brooklyn, N. Y.—Sewer contracts have been awarded as follows: Eastern Parkway, Daniel J. Creem, $20,200; Butler-st., Edward Gorman, $20,700.

Chicago, Ill.—Nash & Dowdle secured the contract for the extension of the intercepting sewer from Pratt-ave. to Bryan-ave., for $30,000.

Green Bay, Wis.—J. H. Case was awarded a contract Nov. 14 for constructing sewers in several streets at 72 cts. a lin. ft.

Monticello, Ind.—The Greenville Construction company, Greenville, O., has been awarded the contract for 1,628 ft. of 30-in. pipe sewer for $4,169.20.

Spring Lake, N. J.—P. H. Harrison & Sons, New York City, secured the contract for 4,600 ft. of pipe sewers and ocean outlet in this city for $6,941.

Greenville, Ill.—The Charles T. Bray Construction company of Belleville, Ill., has been granted a franchise to construct a sewerage system in this city. The city has the right to purchase after the expiration of 10 years.

Nashville, Tenn.—Sewer contracts were awarded Nov. 10 as follows: Sewer between Cherry and Summer-sts., $497.50; Grundy-st., $1,185.90, and North Front, $476, N. M. Smith; alley, Nashville Plumbing company, $397.80.

Madison, Wis.—The contracts for the sewage disposal plant have been awarded as follows: Fairbanks, Morse & Co., three gasoline engines, $2,245; Gould & Co., two centrifugal pumps, $314; sledge pump, $398; Stillwell-Bierce & Smith-Valle Co., chemical mixer, $345, and filter press, $1,350; J. Fass, pump house, $2,759; total, $7,412.

WATER-WORKS.

CONTEMPLATED WORK.

Brantford, Ont.—This city has appropriated $20,000 for water main extensions.

Middletown, N. Y.—The question of filtration is being considered. T. W. Davy, sup.

Bath, Me.—Improvements in the pumping machinery and water supply have been recommended.

Sioux Falls, S. D.—This city has voted in favor of municipal ownership of the water works.

Grand Rapids, Mich.—The purchase of a new pump for the city water works is contemplated.

Allegheny, Pa.—A new 15,000,000 gallon pump is needed at Montreal. Morris Erristein, chrmn. com.

DuBois, Pa.—Plans for increasing the water supply are being considered. Conn Reed, chrmn. com.

Orange, N. J.—The construction of a pumping station at a cost of $50,000 is contemplated.

Topeka, Kas.—This city voted Nov. 12 to issue $240,000 for municipal water works.

Sheboygan, Wis.—The Sheboygan Water company contemplates the purchase of an 8,000,000 gallon pump.

Ironton, O.—The question of filtration will be voted on in the spring. J. Lloyd, secy. city w. w.

Key West, Fla.—(Special)—An artesian well is needed. C. J. Huelsenkamp, chrm. ways and means com.

West Covington, Ky.—The construction of an emergency water main for Ludlow through this city is contemplated.

Owensboro, Ky.—The city council has decided to extend the water mains on Frederica and McFarland-sts.

Persia, Ia.—About $4,500 will be expended for a water tank, cast iron water mains, gasoline engines, etc.

Detroit, Mich.—An increase in the water works capacity, in order to supply Highland Park and Palmer Park, is contemplated.

White Plains, N. Y.—Surveys are being made for several storage reservoirs, according to report. Fred Seymour, supt.

Philadelphia, Pa.—Three ordinances are in the Select council, providing for the filtration of the city's water supply.

Wellsville, O.—This city voted, Nov. 8, for the extension of the 6, 8, 10 and 12 in. water mains. D. A. Davidson, supt. w. w.

Pasadena, Cal.—Bids will be asked, about Jan. 1, for a water works plant; estimated cost, $100,000. H. H. Markham interested.

Lewiston, Me.—The water commissioners are considering a proposition of the New York Filter Mfg. Co. for a filter plant for this city.

The question of water works will be voted on at the following places: Watervliet, N. Y., Dec. 12; Colton, Cal., Dec. 12; Lakeport, Cal., Dec. 20.

West Superior, Wis.—The Superior Water, Light and Power company contemplates building a water filtration plant; estimated cost, $100,000.

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Lincoln, Neb.—A report and estimates for improving the water supply and replacing mains has been submitted by Ferdinand Bonstedt, cy. engr.

Holyoke, Mass.—Plans and specifications for a filtration plant at the White-st. reservoir have been authorized. Jas. L. Tighe, engr. water dept.

Easthampton, L. I.—The water works project is assured, and as soon as the charter has been granted the contract for the erection of the plant will be let.

The question of issuing water works bonds has been favorably voted on at the following places: Monroe, La.; Berea, O.; Cuyahoga Falls, O.

Timmonsville, S. C.—The committee desires to correspond with manufacturers of electric light and water works machinery. H. H. Traxler, chrmn. com.

Watervliet, N. Y.—Estimates, plans and recommendations for new water works have been submitted and an election will be held Dec. 12; est. cost, $234,495.

Binghamton, N. Y.—The improvement of the wells at the city water works by lowering each one about four feet below the present depth, is contemplated, at a cost of $25,000.

The construction of water works systems is contemplated at the following places: Capac, Mich.; Leipsic, O.; Liverpool, N. S.; Pratt City, Ala.; Markesan, Wis.; Alexandria, S. D.; Independence, Ore.; Jerome, Ariz.; Prophetstown, Ill.; Clarington, O.

St. Charles, Mo.—(Special.)—H. C. Sandfort, cy. clk., says this city will give a 20-yr. franchise and pay $4,000 a year—payable quarterly—during the 20 years for fire hydrants, to the company that makes the best proposition to supply the city and its inhabitants with clear and pure water. Contractors address H. C. Sandfort, cy. clk.

Cincinnati, O.—The specifications for constructing the settling reservoirs at California, and for laying two lines of mains connecting the reservoirs with the pumping station, have been submitted to the water works commissioners. The commissioners will have to readvertise and relet the contract for grading, excavating roads, etc., near the new intake at California.

Sacramento, Cal.—A test is being made of the supply from wells, with a view to getting the city to change from river water, if the well supply is demonstrated to be superior. The trustees contemplate extending the water works and sewerage system, but no definite plans have beeen made. About $13,000 will be expended upon machinery for the water works.

CONTRACTS TO BE LET.

Oil City, Pa.—Bids will be received until Dec. 5 for a 300,000 gal. pumping engine. Park C. Porter, clk. water bd.

Oshawa, Ont.—Bids will be asked in December or January for a water works and sewerage system. C. French, chrm. com. of Fire and Water.

New Richmond, O.—Bids are wanted until be received until Dec. 5 for constructing a system of water works. M. E. Gillette, chrmn. bd. trustees.

Pasadena, Cal.—Bids will be asked about Jan. 1 for a water works plant. H. H. Markham, P. M. Green, A. R. Dodsworth interested.

Toronto, Ont., Canada.—Bids will be received until Dec. 8 for furnishing lead pipe, cast iron pipe, stop valves, etc. Mayor John Shaw, chrmn. bd. control.

CONTRACTS AWARDED.

Olin, Ill.—The contract for water works was awarded to J. L. White of Peru, Ill., for $4,000.

Oelwein, Ia.—The contract for water mains extension was awarded to the Dubuque Construction company.

Beresford, S. D.—W. W. Allen & Co. secured the contract for building the water works system for $4,300.

Utica, N. Y.—The West Canada Water Works company has been granted a franchise to lay water mains in this city and supply consumers.

Seattle, Wash.—The contract for a new water works system was awarded, Nov. 24, to Gahan & Byrne of Chicago for $1,238,000.

Kewanee, Ill.—H. D. Hillert, Aurora, Ill., has been awarded the contract for putting in new water mains in this city for $1,903.

Mount Clemens, Mich.—Henry R. Worthington, New York City, was awarded the contract for furnishing a new pumping engine for $6,800.

Summit, Miss.—(Special.)—Alber & Byrne engrs., say that the mayor and council of Summit, Miss., awarded contracts for city water works to P. H. Porter of Louisville, Ky., for the sum of $13,875.

Fort Wayne, Ind.—Bids were received Nov. 14, for the pump and engine for the water works pumping station on Pape-ave. but the contract was not awarded. Henry R. Worthington, New York City, and the Holly Mfg. Co. of Lockport, N. Y., were the bidders.

Gallipolis, O.—The contracts for the water works at the Ohio Hospital for Epileptics were awarded, Nov. 18, as follows: Reservoir, Geo. M. Snyder, $7,997.85; pumping machinery, H. R. Worthington, $4,864; air compressors, $785, and air lifts, $940, Ingersoll Sargent Drill Co.

Rock Hill, S. C.—The water works contract was awarded as follows: For cast iron pipe, to the American Pipe & Foundry wks., Chattanooga, Tenn.; hydrants and gates, to R. D. Wood & Co., Philadelphia, Pa.; standpipe, to the Lombard Iron wks., Augusta, Ga.; pumps, to Henry R. Worthington, New York City; air lift, to Bacon Air Lift company, New York City; sewer pipe, to Montague & Co., Chattanooga, Tenn.

BRIDGES.

Ord, Neb.—Bids are asked until Dec. 10 for constructing a bridge.

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Bastrop, Tex.—The commissioners' court decided, Nov. 16, to build an iron bridge from Smithville.

Lorain, O.—Bids are asked until Dec. 22 for a county bridge. G. H. Lewis, co. audt., Elyria, O.

Cohoes, N. Y.—Plans have been prepared for a plate girder bridge over the crossing on Ontario-st.

Mt. Pleasant, Ia.—The construction of a bridge between Henry and Des Moines-ave. is contemplated.

St. Johnsbury, Vt.—The erection of a bridge to connect with Somerville is contemplated.

Tonganoxie, Kas.—The board of county commissioners have ordered a number of bridges built.

Chester, Pa.—The erection of an iron bridge over Chester creek, just above Wawa, is contemplated.

Cathlamet, Wash.—Bids are asked until Jan. 1 for constructing a drawbridge. Elmer B. Cotwell, co. audt.

Marietta, O.—The construction of a bridge at Putnam-st. has been recommended by the bridge committee.

Nanticoke, Pa.—A bridge on the Kingston flats is contemplated for next summer at a cost of $6,000.

Clayton, Mo.—Road Comr. Rapp has been instructed to advertise for bids for the construction of iron bridges.

Wilkesbarre, Pa.—An appropriation of $23,000 was made Nov. 12 for constructing 10 iron and 36 stone bridges.

Arcadia, Wis.—The construction of a steel bridge over the Trempeleau river is contemplated by the village board.

Brookhaven, Miss.—Bids are asked until Jan. 3 for a steel bridge across Homochitto river. Bd. supervisors.

Binghamton, N. Y.—The question of building a bridge across the Susquehanna river, at Hayes-st., is being considered.

Leavenworth, Kas.—Bids will be received until Dec. 5 for constructing seven bridges. J. W. Niehaus, co. clk.

Flint, Mich.—The Wrought Iron Bridge company, Canton, O., was awarded the contract for a bridge across the Flint river, for $3,425.

Rome, Ga.—Bids are asked until Dec. 3, for building a wooden or iron bridge across Bush Arbor creek. E. P. Treadway, co. clk.

Quebec, Canada.—Sealed proposals will be received until Jan. 2 for constructing a combined railway and highway bridge across River St. Lawrence. Ulric Barthe, secy. Quebec Bridge company.

Chicago, Ill.—Bids will be received until Dec. 7 for a bridge across the by-pass along the Chicago river. Jas. Reddick, clk. bd. trustees of Sanitary dist.

St. Paul, Minn.—Plans and specifications have been ordered prepared for a bridge over the Northern Pacific tracks on Court-ave. Cy. Engr. Rundlett.

Buffalo, N. Y.—Judge White appointed Nov. 17 the Hon. Joseph V. Seaver, Peter Maischous and Wm. E. Fitzpatrick commissioners to appraise lands for the new bridge at Seneca and Elk-sts.

Black River Falls, Wis.—Petitions have been presented to the county board for appropriations for five bridges. The board has appropriated $800 additional for constructing a bridge over the Black river below Hatfield.

Eau Claire, Wis.—(Special)—C. A. Alderman, cy. engr., says the contract for building the superstructure of the Kelsey-st. bridge was awarded to the Milwaukee Bridge & Iron Works for $26,175, and the substructure to Chas. Stone of St. Paul for $19,960.

GARBAGE DISPOSAL AND STREET CLEANING.

Richmond, Va.—The city council contemplates the construction of a garbage crematory.

Newport, Ky.—No final plans have yet been adopted for a garbage crematory. W. L. Glazier, cy. engr.

Los Angeles, Cal.—The contract for street sweeping was awarded Nov. 14 to O. R. Quinn at $3.90 per sweeping.

Winnipeg, Man.—A proposition to issue $18,000 bonds for a garbage crematory will be submitted to the people.

St. Joseph, Mo.—Plans have been suggested by Street Commissioner Furst for cleaning and sprinkling the streets.

Louisville, Ky.—A committee will be appointed to visit various cities and report the best means for the cremation of garbage.

New Orleans, La.—The street cleaning force has been uniformed in heavy white cotton drill and white helmets.

Camden, N. J.—The Utilization company has been incorporated by Kennedy Crossan, Philadelphia; John T. Dyer, Morristown, N. J.; Horace J. Subers, Ashborne, Pa., and Jos. E. Hays, Camden.

Cleveland, O.—Specifications have been completed for the collection, removal and distribution of garbage in accordance with a resolution adopted by the citizens garbage commission.

Indianapolis, Ind.—This city will make new street sweeping contracts soon. It is thought that under the new plans, forces of orderlies may be concentrated more in the center of the city, with a view to obtaining better results. The appropriation for 1899 is $60,000.

Cincinnati, O.—An ordinance is being prepared with a view to changing the present system of handling garbage in this city. The ordinance, which is being prepared by Judge Miller Outcalt, proposes to remove all the vegetable matter at the same time, paying the city a sum of money for the same.

Philadelphia, Pa.—Bids are asked until Dec. 5 for cleaning streets, inlets and public market houses; for the removal of ashes, sweepings, cut grass, household and stove waste; for removal and disposal of kitchen garbage, dead animals, etc., and for furnishing teams and labor for removing snow from the streets surrounding the city hall and the footways of highway bridges crossing the Schuylkill river during the year. Thos. M. Thompson, Dir. P. W.

Chicago, Ill.—A decision has been handed down by the Supreme Court against the city's awarding 5-yr. garbage disposal contracts. Commissioner L. E. McGann will, it is reported, endeavor to revive the garbage commission established last year to consider the question of building municipal crematories and letting contracts annually for the removal of refuse to those reduction plants.

(Continued on page 29.)

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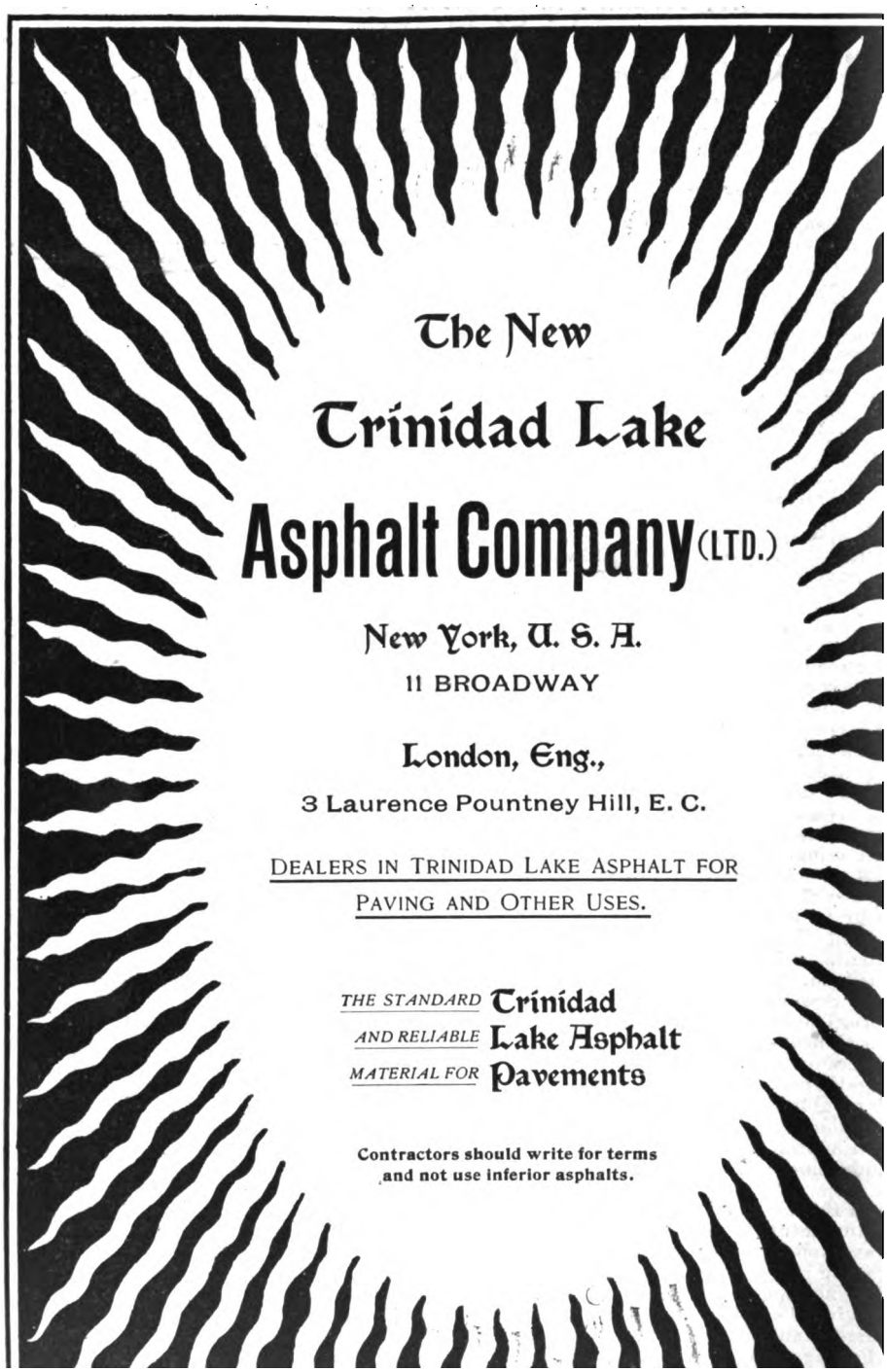

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(Continued from page 401.)

The estimated cost of the crematories is more than $100,000. The commission consists of Mayor Harrison, Commissioner McGann, Superintendent of Streets Doherty, Alderman Powers and ex-Alderman John Maynard Harland.

Milwaukee, Wis.—Charles Lapham of the state sewerage commission for the drainage of the Menominee and Kinnickinnic valleys is urging the supervisors to take up the drainage problem.

PARKS.

Los Angeles, Cal.—The board of park commissioners contemplate improving Sunset park.

Long Beach, Cal.—The city council contemplates improving Pacific park, at a cost of $750, and Ocean Front park, $4,000.

Trenton, N. J.—A resolution was introduced in the council Nov. 15 to lay out a park in the rear of the state capitol building.

Arlington, Mass.—An appropriation of $45,000 was voted Nov. 15 to improve the shores of Spy Pond and construct a boulevard around the pond.

Oakland, Cal.—This city has voted to purchase and improve lands for parks, as follows: Adam's Point, 62 acres, $240,000; improvement of same, $50,000. Improvement of West Oakland park, $20,000; improvement of Independence square, $10,000.

Chicago, Ill.—The Lincoln park commissioners contemplate extending the park from Ohio-st. to Diversey-ave., extend the shore line 1,200 ft. into the lake, and other improvements.

Detroit, Mich.—Park Com'r Moecker has been instructed to prepare plans for the improvement of the grounds around the pumping station. Plans have been accepted for constructing a new driveway leading to Palmer park and other improvements.

Philadelphia, Pa.—Bids are asked until Jan. 14, 1899, for furnishing plans and for the development of League Island park, comprising 300 acres. Prizes of $750 and $250 will be awarded for the two best designs. A. S. Eisenhower, chmn. bureau city property, 130 City hall.

STREET LIGHTING.

Williamsport, Md.—Plans are being made for an electric light plant.

Sturgis, Mich.—This place has voted for a municipal electric lighting plant.

Pierre, S. D.—The establishment of an electric light plant is contemplated.

Chesapeake Beach, Md.—Plans are being prepared for an electric light plant for the Chesapeake railroad company.

Litchfield, Ill.—Bids are asked until Dec. 8 for an electric light plant. Oscar D. W. Gooch, cy. clk.

Wallingford, Conn.—The establishment of an electric light plant is contemplated; estimated cost, about $16,000.

Mt. Pleasant, Mich.—Bids are asked until Dec. 20 for an electric light plant at the Indian Industrial School. R. S. Graham, supt.

Marshfield, Wis.—The city council is considering the question of establishing an electric light plant. John A. Thomas, cy. clk.

Vincennes, Ind.—Bids are asked until Jan. 2 for lighting the streets and alleys with electricity for a period not to exceed 20 years. Geo. E. Green, mayor.

New Richmond, O.—Bids are asked until Dec. 7 for constructing an electric light plant. H. Buckley, prest. bd. electric and w. w. trustees.

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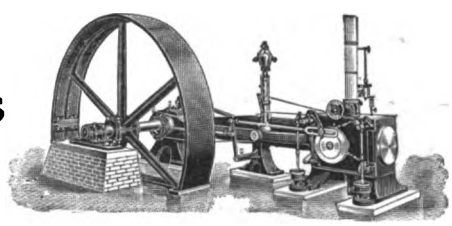

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VINCENNES, INDIANA.

Sealed proposals will be received for lighting the streets, alleys and public places of the City of Vincennes, Indiana, with arc lights of not less than 2,000 candle power each, for a period not to exceed 20 years, from the 25th day of December, 1900, for all night and every night in each year. Also to furnish commercial and private lighting to the citizens of said city for the same period of time. In submitting proposals separate bids must be made, viz: Street, commercial and private lighting, specifically stating the kind and number of lights and the maximum price for each public light; for private and commercial lighting. No proposition will be considered unless accompanied by full and complete plans and specifications, by which it is proposed to furnish the light, which must be attached to each proposition submitted. And all bids must be deemed to cover and include all incidental matters and things necessary to the full and complete working of a first-class modern lighting plant. Said proposals must be filed on or before the 2d day of January, 1899, with the City Clerk of said city, and final acceptance will be made only after full and complete investigation by the Common Council, as to the merits of each and every bid submitted, and an ordinance covering the proposition accepted has been passed by said Common Council. The Council reserves the right to reject any and all bids submitted. All information desired by bidders will be furnished on application to the Clerk. None of said bids to be opened, unless by order of and at a regular session of the Common Council.

GEO. E. GREENE,
Mayor.

Sealed proposals will be received until December 7, in the city of Indianapolis, Ind., for the following improvements: Paving Bird street, from New York to Vermont street, with brick on 4-inch hydraulic cement gravel foundation, placing necessary oak plank marginal finish along the sides. Paving the sidewalks of Thirtieth street, from Meridian street to Capitol avenue, with Class B cement, curbing with stone, and placing necessary double walk stones at street and alley intersections and bowldering same. Paving sidewalks of Capitol avenue as follows: From a point 100 feet south of the south property line of Twenty-second street, to a point 188.40 feet south of the south property line of Twenty-second street, on the east side, and from a point 95 feet south of the south property line of Twenty-second street, extended west to a point 127 feet south of the south property line of Twenty-second street, extended west on the west side. The board of public works reserves the right to reject any and all bids. Address M. A. DOWNING, *President Board of Public Works.*

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Civil engineer, seven years' experience in municipal work, desires position as city engineer or assistant, or with contracting firm. Can furnish instruments: will go anywhere. Address Municipal, care of MUNICIPAL ENGINEERING.

Position wanted by a graduate engineer, nine years' experience; two years on railroad, seven years on highway bridges, roads, streets, pavements, farm drainage and surveying. Fair draftsman. Have instruments and will go anywhere in United States. W. B. H., care of MUNICIPAL ENGINEERING.

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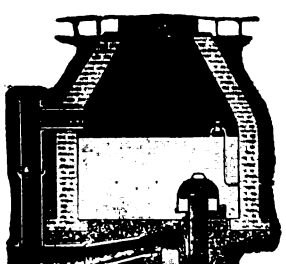

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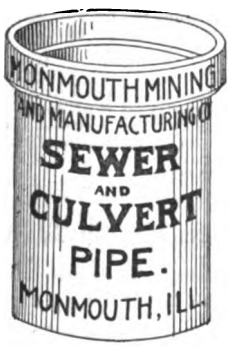

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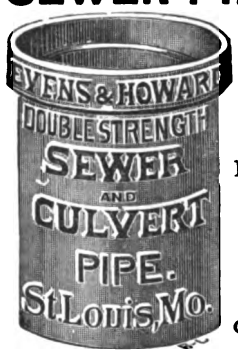

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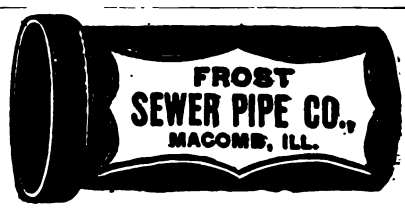

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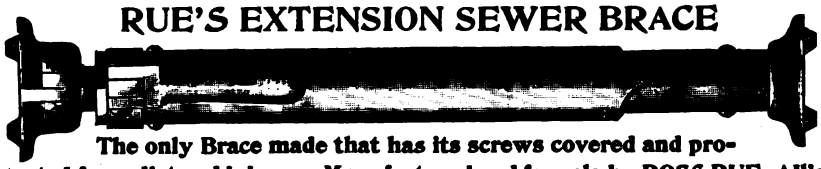
RUE'S EXTENSION SEWER BRACE



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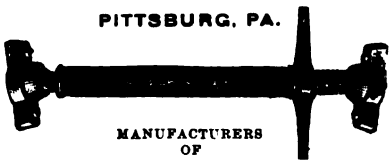

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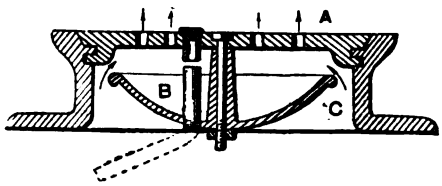

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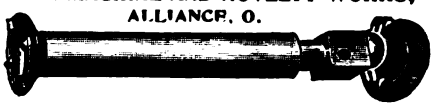

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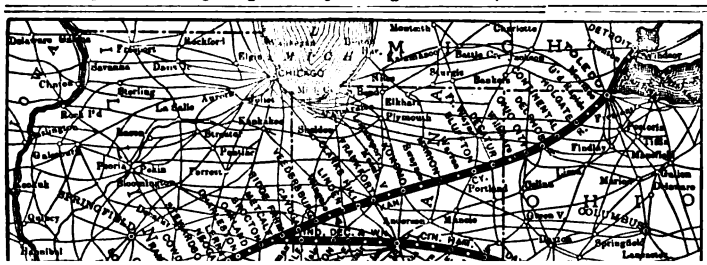

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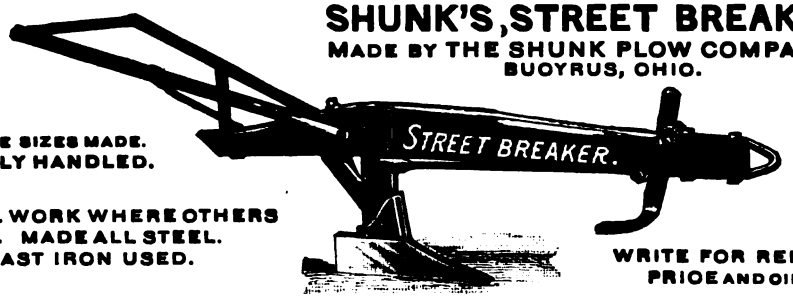

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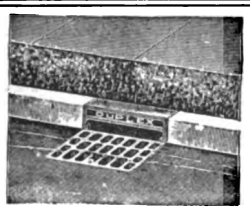

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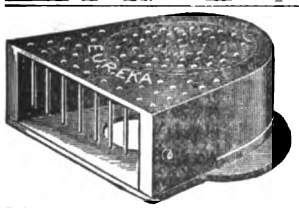

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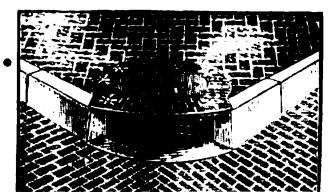

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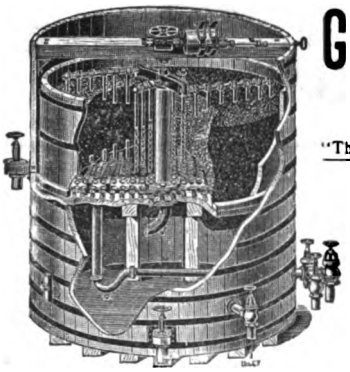

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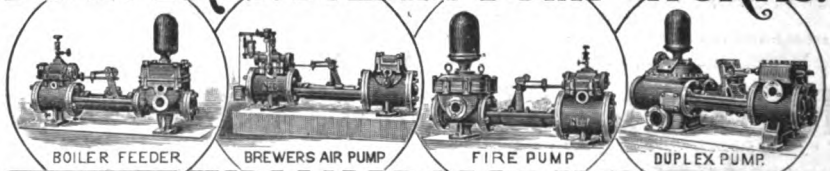

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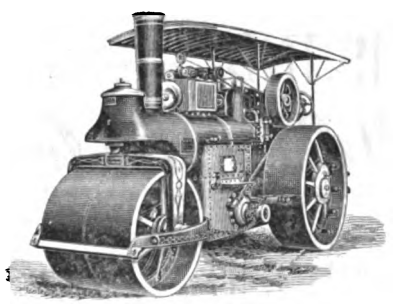

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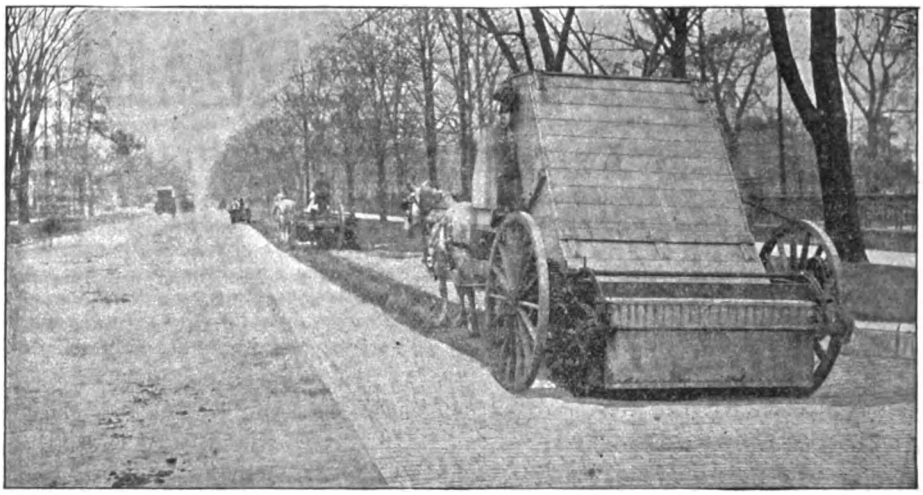

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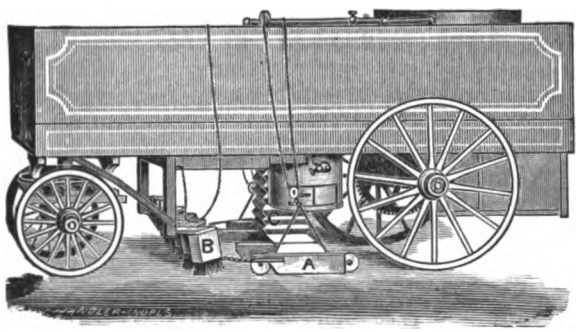

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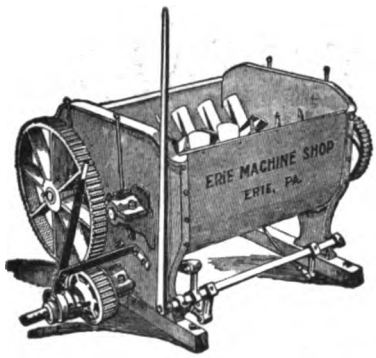

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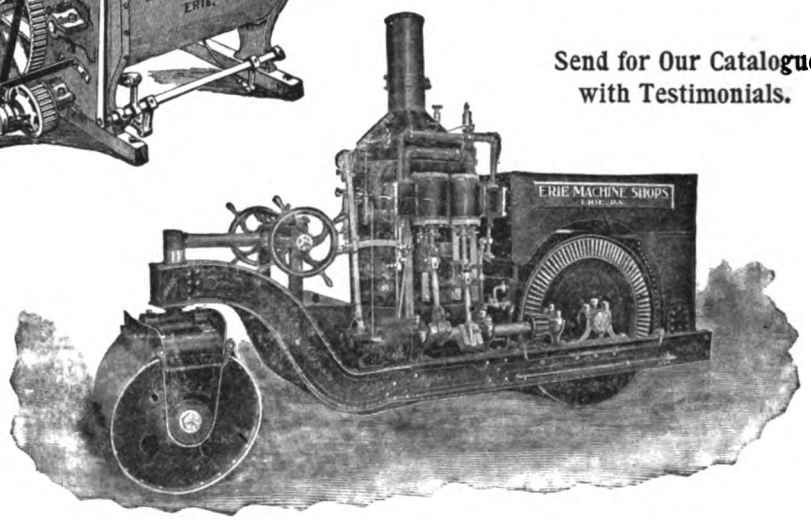

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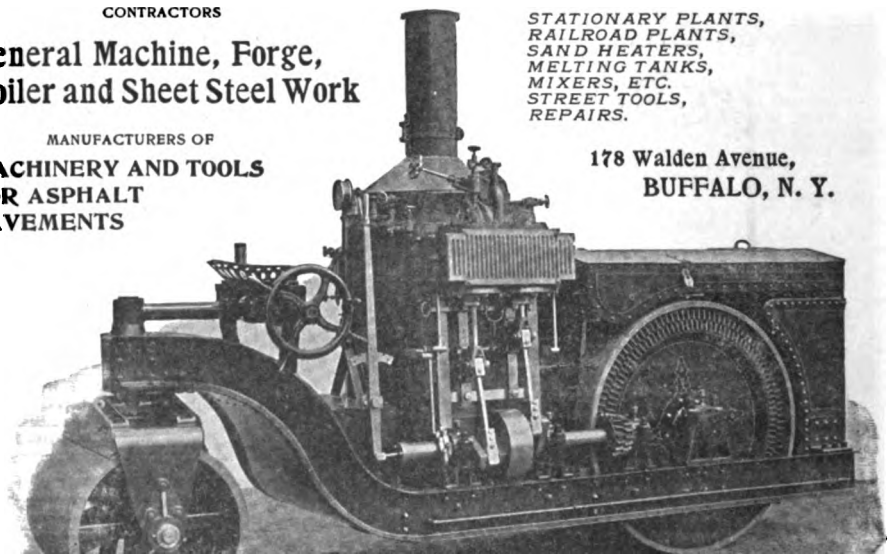

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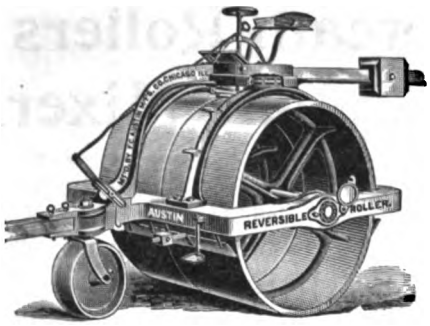

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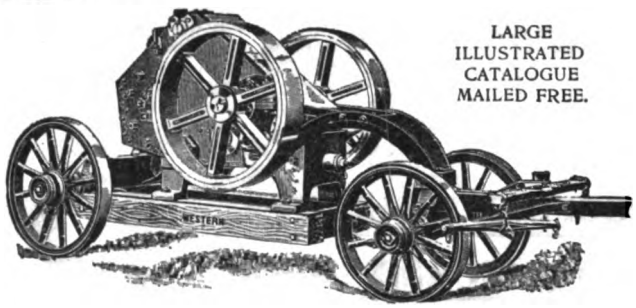

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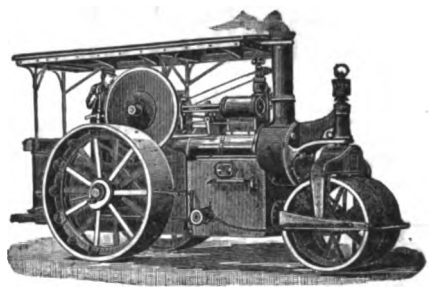

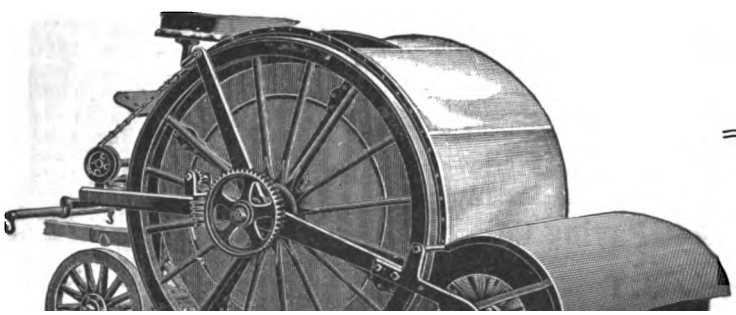

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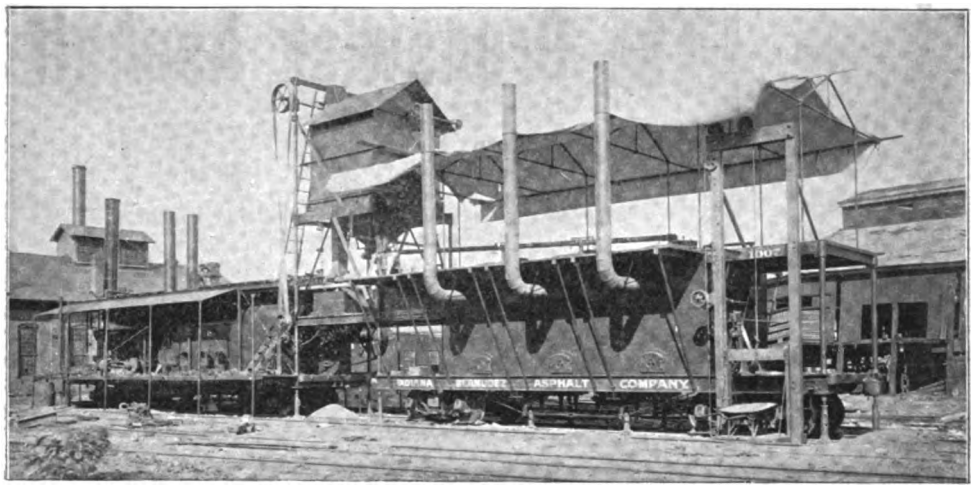

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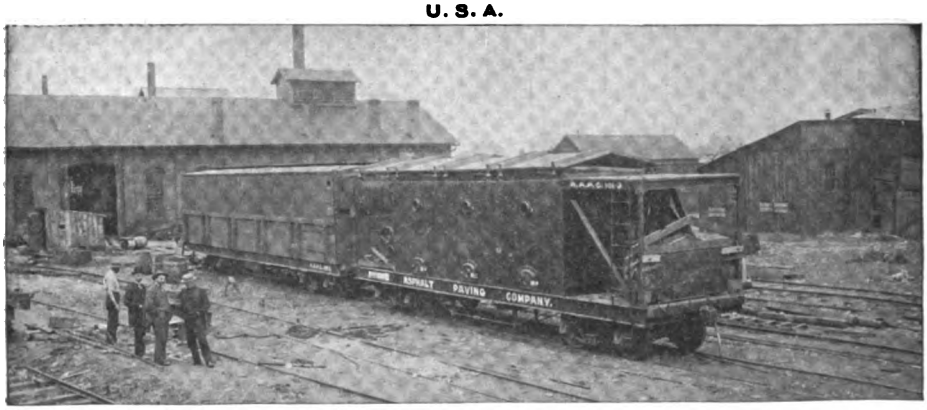

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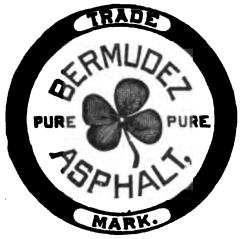

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Blocks 4x4x12 inches. Tiles 8x8x2½ inches.

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Composed of Trinidad Lake Asphalt and Crushed Trap Rock

Subjected to 100 Tons Pressure.

2,675,000 Yards Laid in United States and Mexico.

No Costly Concrete Base Necessary.

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IT CAN BE TAKEN UP AND RE-LAID WITHOUT INJURY.

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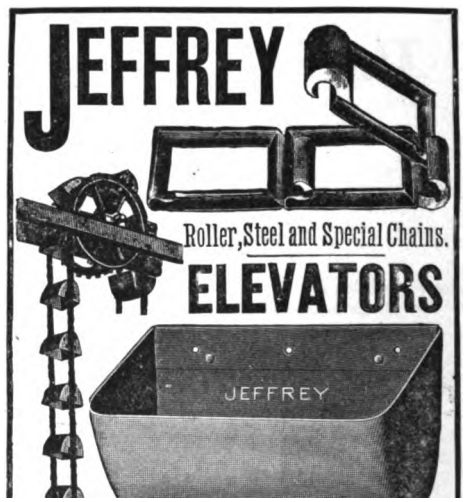

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Unaffected by liquids of any kind. Does not disintegrate.

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For Stone, Wooden or Brick Pavement. **Does not crack or run nor disintegrate. Unaffected by liquids.** Supplied at from 8 cts. per gallon up.

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For Roofs, Iron Work, Bridges, Etc.
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Tensile strength (7 days) two parts sand to one cement.....335 lbs.
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CAPACITY 5,000 BARRELS PER DAY.
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